AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

FEBRUARY 1, 1956

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A CHILTON PUBLICATION

Maytag switches to STANICOOL HD *Soluble Oil— makes two-way saving*

1 *Cost of soluble oil reduced*

2 *Soluble oil consumption cut two-thirds*

A 300 ton Verson press at the Maytag plant, Newton, Iowa, is used for piercing holes in the inner tubs of Maytag's fine automatic washers. Material used is 18 gauge enameling iron. Holes are pierced in six automatic cycles. A total of 936–3/16 inch holes and 6–19/32 inch holes are incised in each tub.

A check of manufacturing costs on the tubs disclosed that the cost of soluble oil per unit produced was too high. Standard Oil lubrication specialist J. I. Nelson, working with plant management suggested a switch to STANICOOL HD Soluble Oil. The switch was made and Maytag received the first part of its two-way saving: the cost of soluble oil per gallon was reduced. Then it was found that the same high quality product could be turned out, without loss of tool life, while spraying only every third tub. Formerly *each* tub was sprayed with soluble oil before punching. With STANICOOL HD, soluble oil consumption was reduced two thirds. And thus, Maytag received part two of its two-way saving.

Perhaps STANICOOL HD Soluble Oil can help you make similar savings. Find out. Call your nearby Standard Oil office in any of the Midwest or Rocky Mountain states. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

Dwight Norton (right) a Maytag plant foreman inspects automatic washer inner tub with Jesse I. Nelson, Standard Oil lubrication specialist. Jesse Nelson is well qualified to provide lubrication technical service. He has a B.S. degree in engineering from the University of Iowa and has completed the Standard Oil Sales Engineering School. Jesse has been helping customers with lubrication problems for more than three years. Customers find his experience and training pay off *for them.*

STANDARD

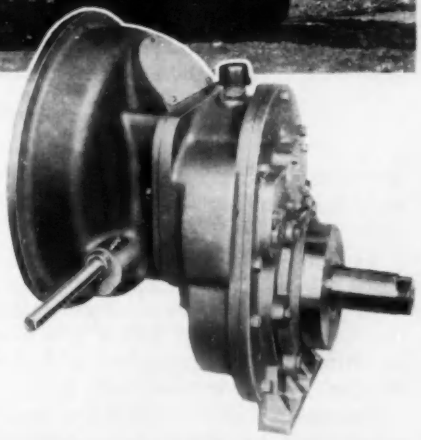
STANDARD OIL COMPANY
(Indiana)

Quick facts about

STANICOOL HD Soluble Oil

- Emulsifies readily with all waters.
- Forms stable, uniform emulsion.
- Does not turn rancid.
- Non-injurious to men, machines and work.
- Economical. Meets work requirements with relatively low emulsion concentrations.
- Prevents rusting of work and machines.
- Gives better tool life.
- Doesn't form gum on machines.

Cuts Cost... saves space... with COTTA Reduction Unit



Problem: Facilitate engine replacement in crane. Solution: Crane repowered with modern gas or diesel engine. Adapted new engine output speed to meet conditions in original crane mechanism by installing a Cotta Reduction Unit. Cotta's compact design saves valuable space. Cotta's rugged construction intended for heavy duty service.

THIS INFORMATION WILL HELP YOU

Sent free on request — diagrams, capacity tables, dimensions, and complete specifications. State your problem — COTTA engineers will help you select the right unit for best performance. Write today.

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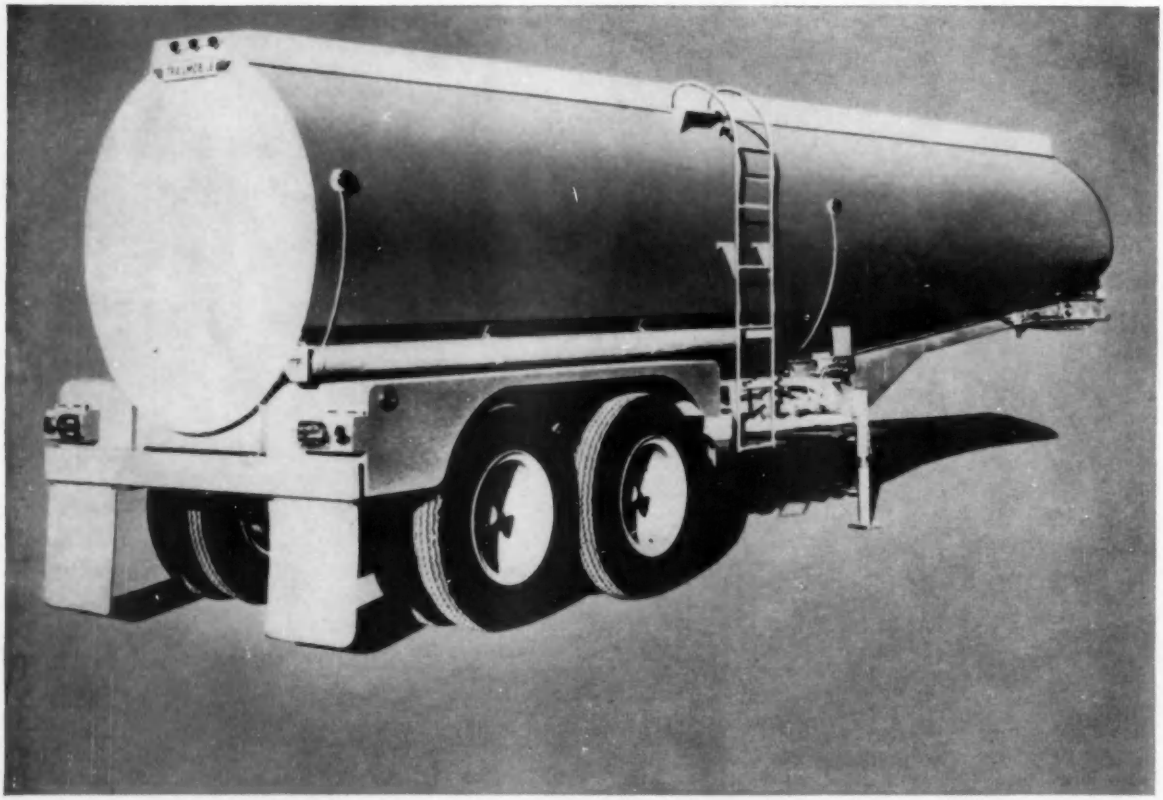
HEAVY-DUTY TRANSMISSIONS
"Engineered-to-order"



Most recent design of lightweight steel tank-trailer developed by the Tank Division, Trailmobile, Inc., at Springfield, Mo., where the unit is now in production. Designers stripped off needless weight by using USS COR TEN, a high-strength, low-alloy steel containing nickel, produced by United States Steel Corp., Pittsburgh, Pa.

2440 pounds trimmed off...

Use of high strength low alloy nickel-copper steel adds capacity to trailer

REDUCED OPERATING COST is one result of this weight reduction. There's less wear on tires and brakes. And fuel is saved every day.

Yet payload is up. Over-all strength of the unit is unchanged.

In place of hauling needless weight every trip, this tank-trailer can deliver 400 extra gallons of gasoline or 340 extra gallons of fuel oil. Either increases revenue per ton mile.

Engineers at Trailmobile, Inc. aimed for several advantages by using basic properties of high strength low alloy steel containing nickel. In thin light section, steels of this type provide the same strength as thicker, heavier sections of carbon steel. But reduction of deadweight is not the entire story.

Offering high resistance to atmospheric corrosion . . . 4 to 6 times that of carbon steel . . . the nickel alloyed steels retain a high proportion of their original strength during years of use. This assures longer equipment life and cuts down maintenance and repair costs.

In addition, you'll find that high strength low alloy steels containing nickel can be hot or cold formed about as readily as mild carbon steels. Use of these steels helps to reduce unit labor cost as well as production time.

Produced under various trade-names by leading steel companies, high strength low alloy steels containing nickel along with other alloying elements, offer money-saving advantages. Learn more about these steels . . . send for a copy of "Nickel-Copper High Strength Low Alloy Steels." It discusses design factors, corrosion-resistance and the like. Write for it now.

INCO TRADE MARK **THE INTERNATIONAL NICKEL COMPANY, INC.** 67 Wall Street New York 5, N. Y.

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE — PUBLISHED SEMI-MONTHLY

FEBRUARY 1, 1956 — VOL. 114, NO. 3

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NEW!

ROTOR AIR SCREW DRIVERS AND NUT SETTERS

Powerful! Light!

Rugged . . . long-life construction

More power per pound

Simplified torque adjustment

3 types of drives

Reversible or non-reversible motors

TYPICAL SPECIFICATIONS

Reversible* . . . Adjustable Clutch† Type

Type	Handle ¼" Air Inlet	Free Speed at 90# Pres.	CAPACITY Free Run. Screws	Bolt Size	Wt. (Lbs.)	Lgth. (Ins.)	Spindle Side to Center (In.)
S-02-PRC	Pistol	2000	#2 to #12	To ¼"	2¼	8¾	25/32
S-02-PRC	Pistol	850	#2 to #12	To ¼"	2½	9¼	25/32
S-02-PRC	Pistol	450	#2 to #12	To ¼"	2½	9¼	25/32
S-02-LRC	Lever	2000	#2 to #12	To ¼"	1⅞	10	25/32
S-02-LRC	Lever	850	#2 to #12	To ¼"	2⅛	10½	25/32
S-02-LRC	Lever	450	#2 to #12	To ¼"	2⅛	10½	25/32

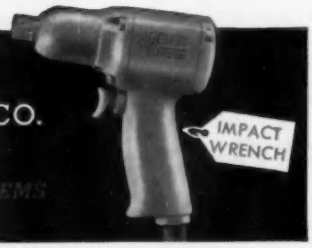
*Also Non-Reversible †Also Positive Clutch and Direct Drive

WRITE FOR BULLETIN No. 46

THE ROTOR TOOL CO.

CLEVELAND, OHIO

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS



Customer reports

81% average savings

in Machining Time with . . .

BULLARD

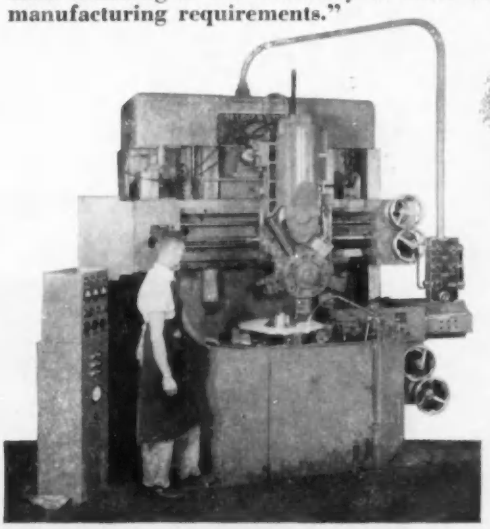
CUT MASTER V.T.L.

MODEL 75

At the York, Pennsylvania plant of the York Corporation, manufacturers of refrigeration and air conditioning equipment, the new 36" Cut Master is running 24 hours a day machining hubs and covers for a turbo compressor impeller wheel.

They have calculated an 80% savings in machining time on the hub disc and 82.3% on the cover disc. As a result, the overall savings in all manufacturing operations for the turbo wheel amounts to 57.7%.

"The quality of the machined finish that we get with our new Cut Master, Model 75," says Mr. R. P. Feiser, Industrial Engineer, "is of such high standard that hand finishing is not necessary to meet our exacting manufacturing requirements."



These same savings can be applied to your manufacturing cost problems — for full information call your nearest Bullard Representative or mail coupon for Catalog to

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286 CANFIELD AVE.
BRIDGEPORT 2, CONN.

PLEASE SEND ME A COPY OF THE NEW CUT MASTER, V.T.L., Model 75 CATALOG

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ADDRESS_____

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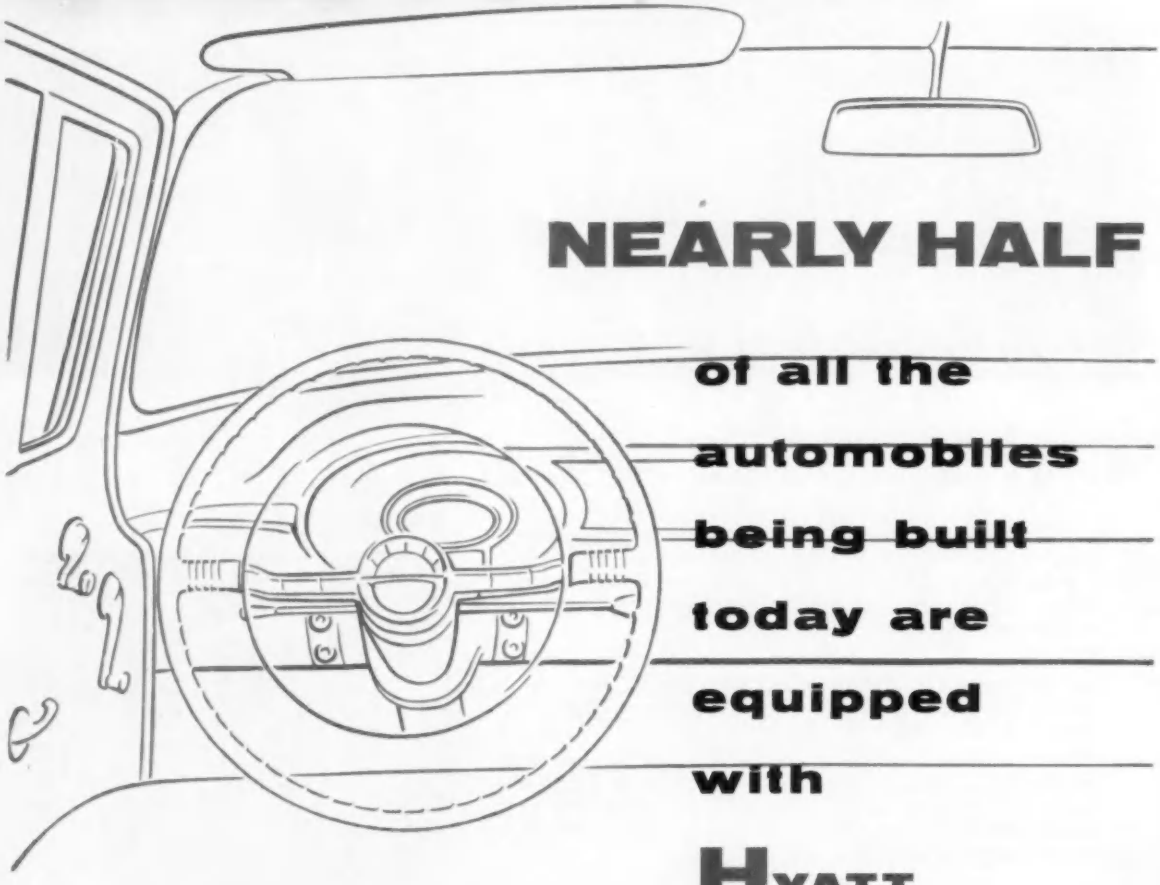
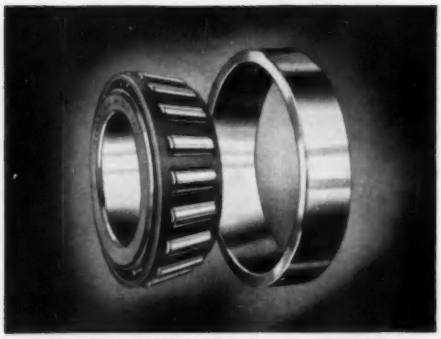


NEARLY HALF

of all the automobiles being built today are equipped with

HYATT taper roller bearings

HYATT, America's *first* and *foremost* manufacturer of straight cylindrical roller bearings, is also a leading supplier of *taper* roller bearings to the automotive industry. Every HYATT *taper* roller bearing must measure up to traditional HYATT standards of precision and dependability. Remember—in *tapers*, too, HYATT means *highest quality*. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.



Typical HYATT *taper* roller bearing for use in rear axle of 1956 passenger car.

GM GENERAL MOTORS

HYATT ROLLER BEARINGS

STRAIGHT BARREL TAPER

announcing Accopac N-820:

a dense fiber gasket for high bolt loads at temperatures up to 250°F.

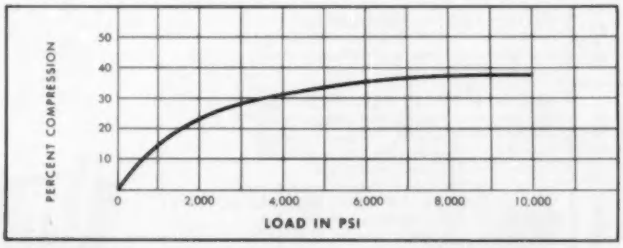
Accopac® N-820 is a new beater-saturated gasket material designed for applications where a combination of heat and pressure may cause conventional plant fiber materials to fail. For example, N-820 is an economical replacement for sheet asbestos packing in applications involving bolt loads of 2,000 psi and upward and where temperatures do not exceed 250° F.

Here's why N-820 can be used successfully in these tough jobs:

High density: N-820 is much more dense than previously available fiber sheets. It withstands test pressures up to 100,000 psi without crushing. N-820 conforms well to flange surfaces and maintains torque much better than softer materials saturated by ordinary methods.

Non-extractable binder: N-820 has no volatile binder which could be lost at temperatures up to 250° F. Its sealing properties are not affected by the leaching action of contained fluids or by alternately wet-and-dry applications. Shrinkage due to binder loss is eliminated with N-820.

N-820 is the newest member of the Armstrong Accopac family, and it's already being used in many heavy-duty applications in place of more expensive materials. If you'd like more information about Accopac N-820, write for samples and data sheet to Armstrong Cork Company, Industrial Division, 7002 Imperial Ave., Lancaster, Pennsylvania.



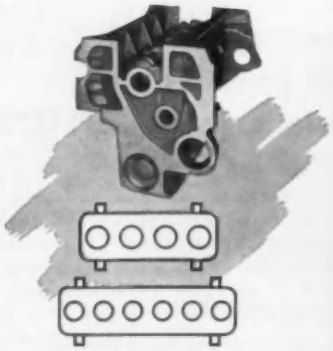
COMPRESSIBILITY. N-820, less compressible than other Accopac materials, is recommended for heavy-duty applications where flange pressures will be 2000 psi or more and where temperatures do not exceed 250° F.

Armstrong ACCOPAC

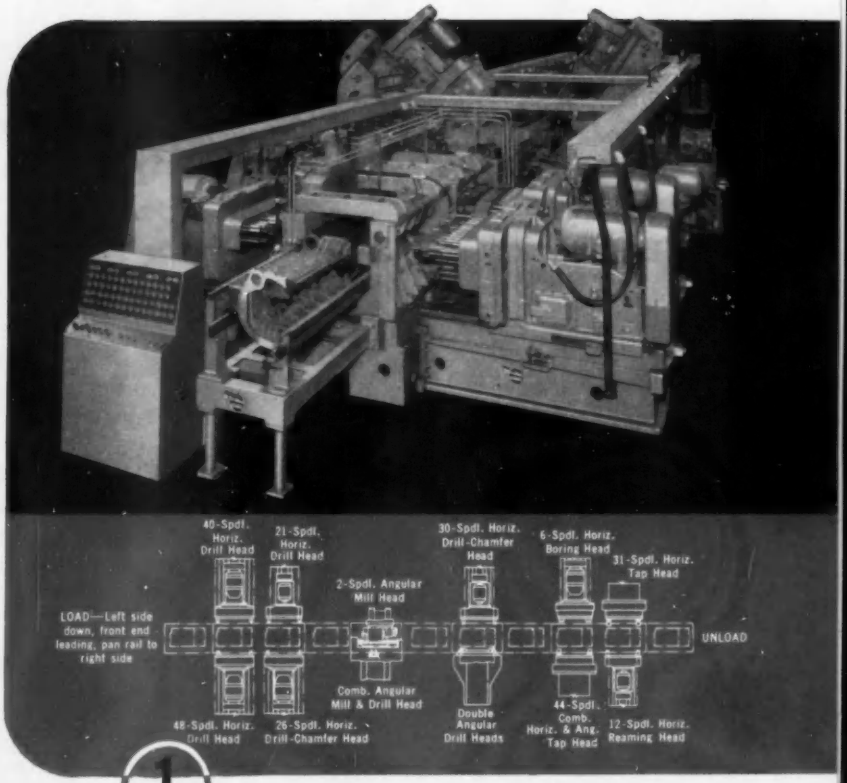
. . . used wherever performance counts

DUAL-PURPOSE SPECIALS·

● Here's another outstanding example of how W. F. & John Barnes Coordinated Creative Engineering and Manufacturing Service has helped cut production costs . . . this time for a well-known farm equipment manufacturer. These three special machines have been ingeniously designed to machine TWO SIZES of tractor engine blocks . . . double-duty performance that not only means a lower original investment, but also simplifies tooling, reduces floor space requirements, and increases over-all production efficiency. Careful planning of tooling and machine components holds change-over time to a minimum . . . in fact,



Both 4 and 6-cylinder blocks are processed on the same Barnes' Special Machines.


40-Spdl. Horiz. Drill Head
21-Spdl. Horiz. Drill Head
2-Spdl. Angular Mill Head
30-Spdl. Horiz. Drill-Chamfer Head
6-Spdl. Horiz. Boring Head
31-Spdl. Horiz. Tap Head
LOAD—Left side down, front end leading, pan rail to right side
UNLOAD
Comb. Angular Mill & Drill Head
48-Spdl. Horiz. Drill Head
26-Spdl. Horiz. Drill-Chamfer Head
Double Angular Drill Heads
44-Spdl. Comb. Horiz. & Ang. Tap Head
12-Spdl. Horiz. Reaming Head

1 Barnes 11-Station Progress-Thru Machine completes drilling, tapping, and milling operations on the 4 and 6-Cylinder Diesel Engine Blocks. Bushing plates, guide rails, head stops, transfer pusher fingers, and other machine components are quickly adjustable to handle both block sizes.

SAVE TIME WITH BARNES' COORDINATED 6-POINT BUILDING SERVICE

"Shopping around" is often a costly, time-consuming task, and all too often the results are disappointing . . . that's why Barnes offer a complete machine tool building service from *one convenient source* . . . it saves time and cuts costs because all the work is coordinated in one plant. Barnes' service includes:

1. **SPECIALIZED MANUFACTURING FACILITIES**—75-year background, large well equipped plant efficiently tooled to build high production machines.
2. **SPECIAL HYDRAULIC EQUIPMENT**—designed and built to meet JIC standards. Individually engineered units assure smooth, dependable actuation for every requirement.
3. **SPECIAL ELECTRICAL EQUIPMENT and CONTROLS** — individually designed and built for maximum safety and ease of control, with circuits that assure the most dependable coordination of all machine functions.
4. **SPECIAL GAUGES, FIXTURES, TOOLS**—designed for each individual machining problem, assure accuracy of operations at high production speeds.
5. **SPECIAL HANDLING AND CONVEYOR EQUIPMENT**—designed and built to reduce work handling, affect maximum safety and efficiency.
6. **COORDINATED DESIGN AND ENGINEERING**—Mechanical, Hydraulic, Electrical, Process, Tool, and Fixture Engineers work together at Barnes. Team-work solves complex problems quickly.

W. F. & JOHN BARNES

Builders of Better Machines Since 1872

Multiple Spindle Drilling • Boring

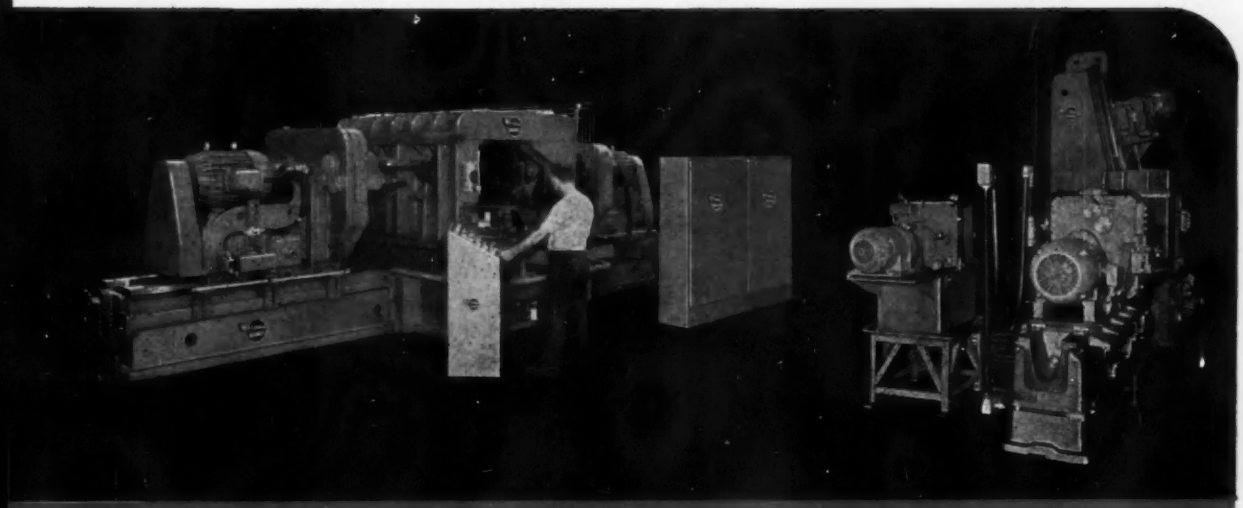
• MACHINE BOTH 4 AND 6 CYLINDER ENGINE BLOCKS

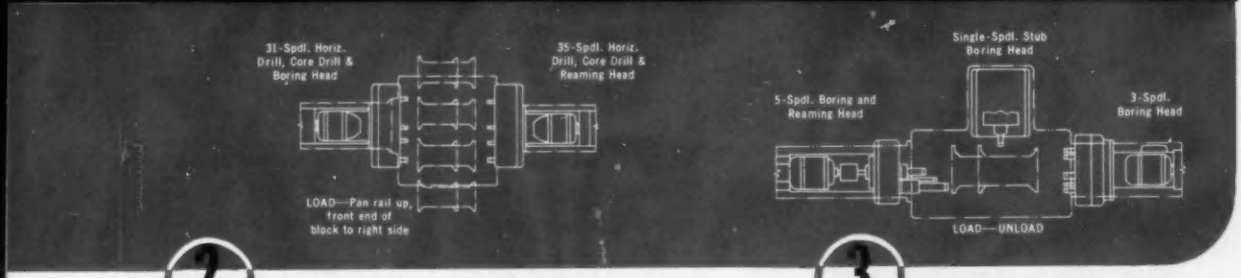
much of the tooling is common to both block sizes and does not require changing. Bushing plates, guide rails, head stops, and transfer pusher fingers quickly and easily adjust to accommodate for variations in the two block designs. Where tooling changes are required, easy accessibility and quick conversion and set-up features speed the change-over.

OVER 75 YEARS OF MACHINE TOOL BUILDING EXPERIENCE

This unusual application is only one of many produced by Barnes . . . the result of over 75 years of accumulated knowledge in the highly specialized machine tool field. Creative skills, plus complete and extensive building facilities, assure you of machines possessing maximum capability for lowering production costs and improving product quality.

ASK FOR AN ANALYSIS OF YOUR PRODUCTION METHODS . . . YOUR PROBLEMS WILL RECEIVE EXPERT AND INDIVIDUAL ATTENTION




31-Spdl. Horiz. Drill, Core Drill & Boring Head
35-Spdl. Horiz. Drill, Core Drill & Reaming Head
LOAD—Pan rail up, front end of block to right side
Single-Spdl. Stub Boring Head
5-Spdl. Boring and Reaming Head
3-Spdl. Boring Head
LOAD—UNLOAD

2 **Barnes Special 4-Station Progress-Thru Machine completes drilling, boring, and reaming on the blocks. Here again, adjustable features are built in to compensate for the two block sizes. Electrical interlocks on these machines prevent accidental tool damage during change-over. Idle stations are included for future tapping operations.**

3 **Special 3-Way Cam and Crank Boring Machine precision bores both block sizes. Adjustment features are similar to the preceeding machines. All units are electrically controlled for automatic cycle sequence with push-button operation.**

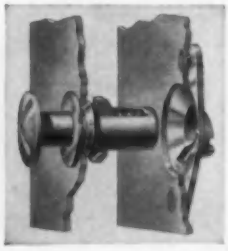
Write Today **FOR YOUR COPY** of "Coordinated Machine Engineering"—a 32-page booklet of automation equipment ideas.

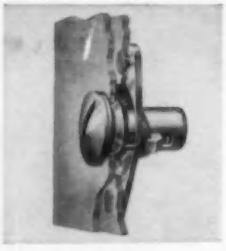
W. F. & JOHN BARNES COMPANY

403 SOUTH WATER STREET, ROCKFORD, ILLINOIS

Tapping Machines • Automatic Progress-Thru and Transfer Type Machines

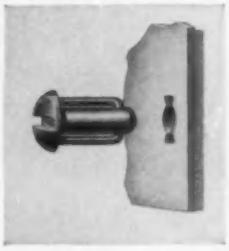
3 ways to save on assembly costs





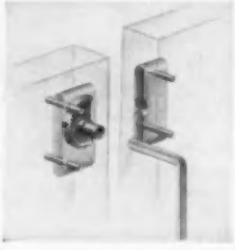
QUICK-LOCK

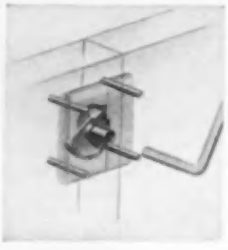
For fastening removable access doors and panels. Because of its ease of installation, QUICK-LOCK is ideal for assembling removable panels. A 90° turn locks it in place. Stud is self-ejecting when unlocked; visual inspection shows whether fastener is locked. Spring loading takes initial load; solid supports carry increased load. Available in a wide range of sizes.



SPRING-LOCK

One-piece fastener for blind holes has load-carrying steel spring wire. Spring steel arms lock fastener securely, prevent loosening under vibration. SPRING-LOCK will work with varying panel thicknesses, locks with a twist of the wrist. Made in all-metal and plastic with steel insert. The molded design permits heads to be made in various shapes for refrigerator shelf supports, washer knobs, brackets. Available in a wide variety of shapes and sizes, and also in custom designs.





ROTO-LOCK

Serrated, tapered cam is engaged by formed lug as fastener is locked. Cam action draws panels together tightly, insures locking even under conditions of misalignment. Opens easily for demounting. ROTO-LOCK carries heavy tension and shear loads; can be used for air and water-tight seals; recesses completely into panels. Solidly built without springs or delicate mechanical parts, unaffected by arctic temperatures or field service.

Simmons

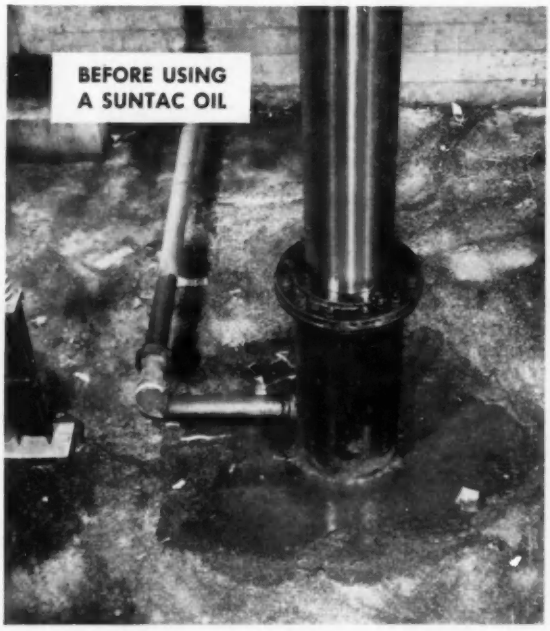
QUICK-LOCK
SPRING-LOCK
ROTO-LOCK
LINK-LOCK
DUAL-LOCK

JUST OUT!
NEW 36-PAGE CATALOG WITH APPLICATIONS
SEND FOR IT!

Simmons Fasteners are widely used in refrigerators, washing machines, electrical equipment, electronic assemblies, prefabricated portable shelters, coolers, demountable furniture. Every Simmons Fastener is a service-proved design with a long record of assembly-cost saving in many industries.

If you are interested in cutting your costs, turn to Simmons Fasteners—the fasteners with *uses unlimited*. Write for samples and catalogs today.

SIMMONS FASTENER CORPORATION
1749 NORTH BROADWAY, ALBANY 1, NEW YORK



SUNTAC CUTS OIL WASTE, MAINTENANCE COSTS

High quality Suntac oils reduce drip...throw-off...squeeze-out... cut leakage an average of 35% and up to 90% in some cases.

Before using Suntac oil, a prominent eastern manufacturer had to add excessive make-up oil to the hydraulic system of his freight elevator. Oil leakage caused a continual housekeeping problem...the pit had to be cleaned out every six to eight weeks and maintenance costs were high.

Now, one year after switching to a Suntac oil, make-up has been drastically reduced, and frequent pit clean-ups are no longer necessary.

The reason: Suntac oils are specially compounded oils with adhesive-cohesive characteristics that enable them to cling to parts where other oils would drip, throw-off, leak, and squeeze out.

For complete information about Suntac oils, see your Sun representative, or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AA-2.

SUNOCO®

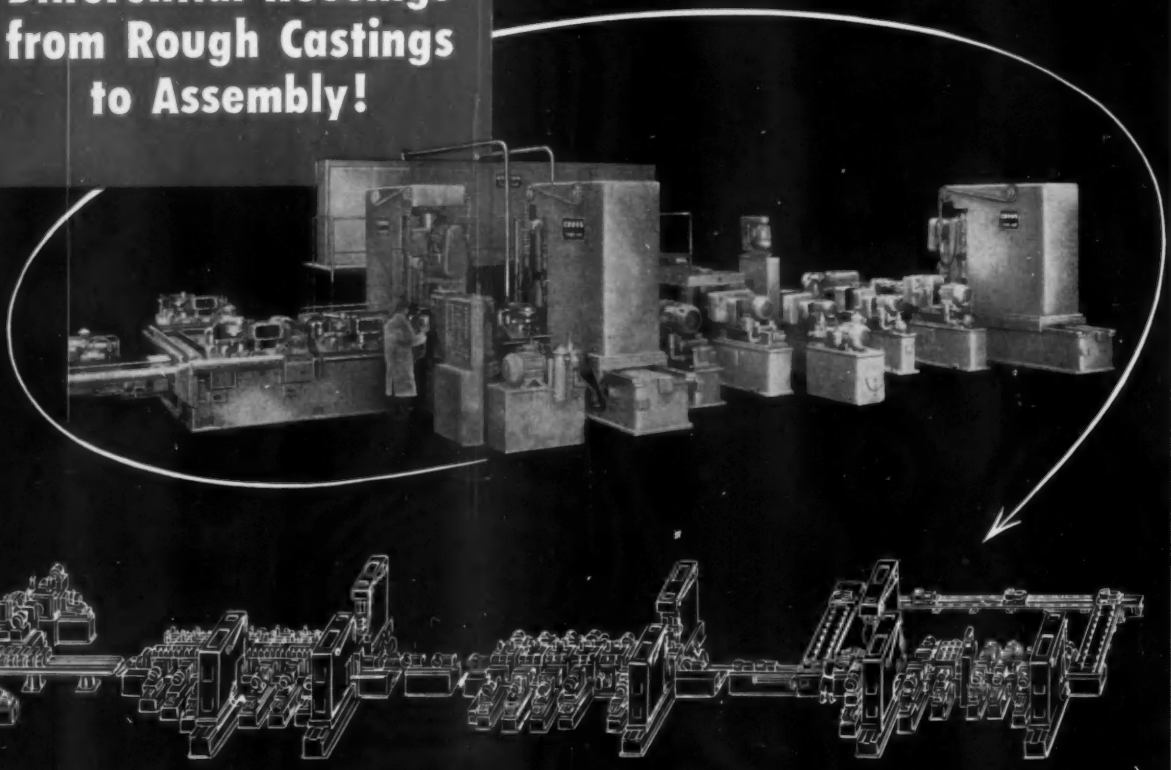
INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY, PHILADELPHIA 3, PA.

IN CANADA: SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

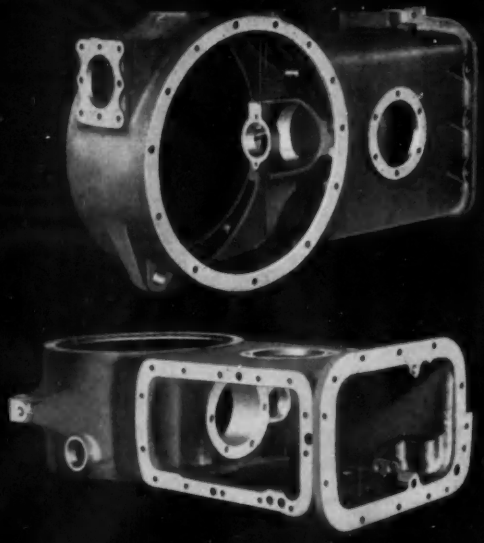
Tractor Differential Housings from Rough Castings to Assembly!

Another Transfer-matic by Cross



The new Cross Special Machine above is one of four sections which constitute a complete production line. Together, they process 46 tractor differential housings per hour from rough foundry castings to assembly. The line is 225 feet long with 31 stations. It performs 313 operations, including 19 milling, 7 cross-facing, 110 drilling, 17 boring, 72 chamfering, 4 spot-facing, 8 reaming and 76 tapping.

Like all Cross machines, the parts—even tooling details—are made to interchangeable tolerances for fast, easy maintenance and to provide flexibility for model changes—an important Cross advantage both from the standpoint of operating costs and investment. This production line is another example of Cross Sectionized (Segmented) Automation.



Established 1898

THE CROSS CO.

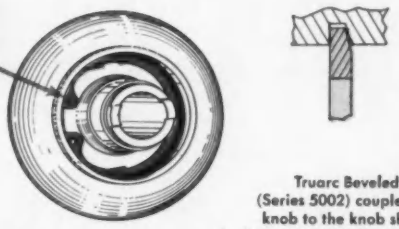
First in Automation

DETROIT 7, MICHIGAN

Waldes Truarc Retaining Rings Eliminate Machining— Provide Stronger Assembly, Greater Accuracy

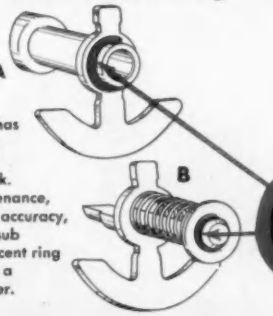
The American Hardware Corp., New Britain, Conn., uses 4 different types of Waldes Truarc Retaining Rings in the original design of these famous Corbin and Russwin Heavy Duty Cylindrical Locks. Truarc rings improve product performance, eliminate rejects, and cut labor costs.

Knob Sub Assembly



Truarc Beveled Ring (Series 5002) couples the knob to the knob shank. It eliminates two tapped holes and two screws, provides stronger assembly and greater accuracy. Beveled ring takes up end play rigidly.

Spindle Sub Assembly



Spindle sub assembly "A" has two Waldes Truarc crescent rings (Series 5103) used as locating flanges for rollback. This saves labor and maintenance, improves performance and accuracy, eliminates rejects. Spindle sub assembly "B" uses one crescent ring as a spring retainer and as a locating shoulder for washer.

Cylinder Sub Assembly

Knob unlocking mechanism uses one Truarc E-ring (Series 5133) as a spring retainer and one inverted ring (Series 5108) for retaining the cylinder plug. Rings are re-usable in the event of disassembly for maintenance. Rejects are eliminated.

Whatever you make, there's a Waldes Truarc Retaining Ring designed to improve your product...to save you material, machining and labor costs. They're quick and easy to assemble and disassemble, and they do a better job of holding parts together. Truarc rings are precision engineered and precision made, quality controlled from raw material to finished ring.

36 functionally different types...as many as 97 different sizes within a type...5 metal specifications and 14 different finishes. Truarc rings are available from 90 stocking points throughout the U.S.A. and Canada.

More than 30 engineering-minded factory representatives and 700 field men are available to you on call. Send us your blueprints today...let our Truarc engineers help you solve design, assembly and production problems...without obligation.

For precision internal grooving and undercutting...Waldes Truarc Grooving Tool!

Send for new catalog supplement

WALDES

TRUARC®

RETAINING RINGS

Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y.
Please send the new supplement No. 1 which brings Truarc Catalog RR 9-52 up to date.
(Please print)

*Name*_____

*Title*_____

*Company*_____

*Business Address*_____

*City*_____ *Zone*____ *State*_____

AY028

WALDES TRUARC Retaining Rings, Grooving Tools, Pliers, Applicators and Dispensers are protected by one or more of the following U. S. Patents: 2,382,948; 2,411,426; 2,411,761; 2,416,852; 2,420,921; 2,428,341; 2,439,785; 2,441,846; 2,455,165; 2,483,379; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,306; 2,491,310; 2,509,081; 2,544,631; 2,546,616; 2,547,263; 2,558,704; 2,574,034; 2,577,319; 2,595,787, and other U. S. Patents pending. Equal patent protection established in foreign countries.

But in **TODAY'S** compact beauties, wasted inches can mean lost sales

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GOODYEAR

THE WORLD'S FINEST, MOST MODERN CUSHIONING

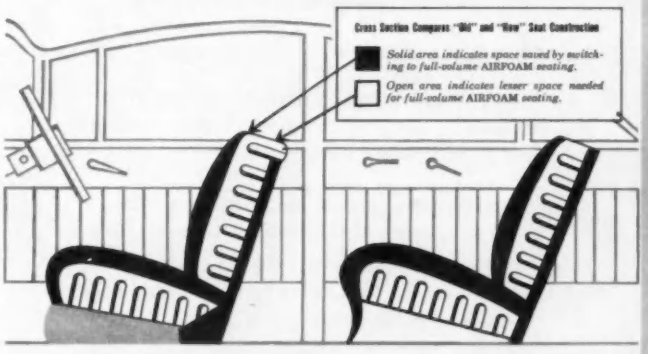
Airfoam—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

When the Argo Electric had a windshield two feet high–

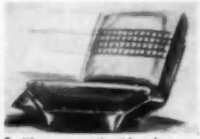
who cared how high they piled the SEATING?

How **AIRFOAM** creates sales by creating

R-O-O-M
FOR COMFORT


Cross Section Compares "Old" and "New" Seat Construction
Solid area indicates space saved by switching to full-volume AIRFOAM seating.
Open area indicates lesser space needed for full-volume AIRFOAM seating.

AIRFOAM makes interiors roomier, more luxurious



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Premolded **AIRFOAM** replaces expensive handwork — looks even richer

AIRFOAM can be your greatest sales-aid in years

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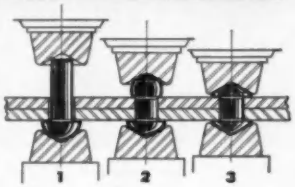
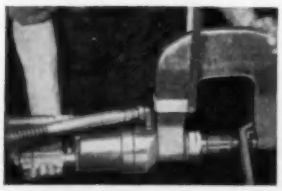
WHY HANNIFIN "HY-POWER" RIVETERS SAVE YOU MONEY

STRONGER JOINTS!

This "silent squeeze" method gives you (1) rapid advance to riveting position, (2) high-pressure shaping of the rivet, cold or hot, and (3) automatic reversal as soon as the rivet is formed. Why are these rivets stronger? Because with this method the rivet shank expands to completely fill the hole and, as the metal flows to shape the heads, fillets are formed under both heads. The rivet is work-hardened, too, and every rivet is uniform.



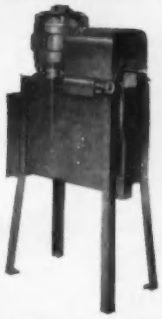
FASTER RIVETING!

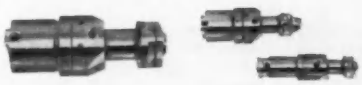


Yes! From the time the button is touched it takes only 2½ seconds to head a ⅜" rivet. *"Hy-Power" is safe, too!* For the stroke can be interrupted and the ram reversed automatically anywhere in the cycle, simply by releasing the control button.

QUIETER OPERATION!

Here's the power source for this modern riveting method . . . it's the Hannifin "Hy-Power" Generator. This compact unit is a combination of motor, pump, oil reservoir, automatic control valves and high pressure intensifier that quietly supplies hydraulic pressure to...





...your "Hy-Power" cylinders—available in 7½, 10, 12½, 17½, 25, 35, 50, 75 and 100-ton capacities (more in multiple). Cylinders can either be mounted in yokes (portable or stationary) or installed in machines of your design.

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Air and Hydraulic Cylinders • Hydraulic Presses • Pneumatic Presses • "Hy-Power" Hydraulics • Air Control Valves

for Special Fasteners to fit your needs
Exactly . . . Economically . . . Send Your Blueprints
to FERRY CAP
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BREAK ALL SHARP CORNERS

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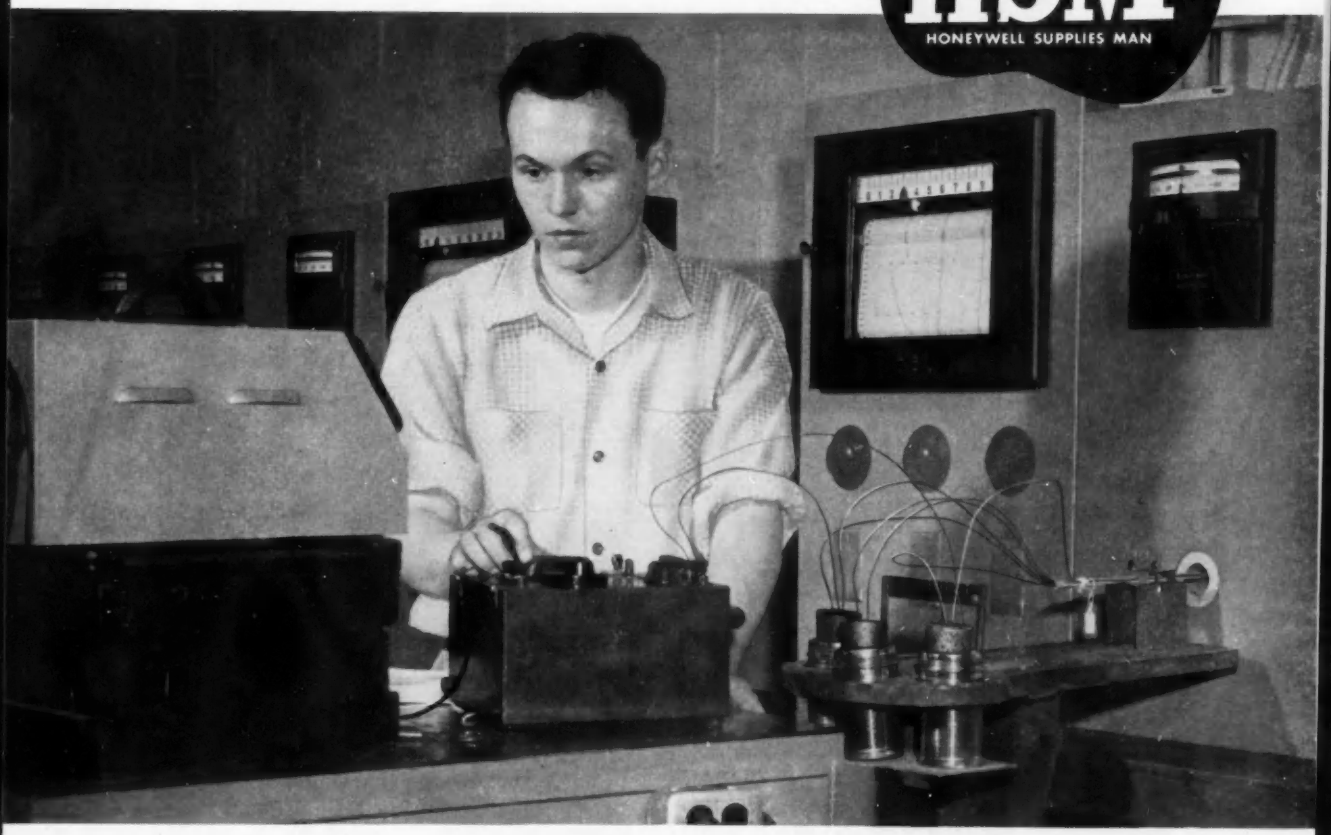
Lab-tested thermocouple wire *available through your*

HSM
HONEYWELL SUPPLIES MAN



CONNECT a thermocouple with only ± 1% accuracy to an instrument with accuracy of ± ¼% . . . and how closely can you measure? The answer is simple. Overall accuracy *can't* be any better than your thermocouple.

To guarantee you consistent accuracy in your temperature detecting elements, Honeywell maintains a fully equipped wire checking laboratory. Here every spool of thermocouple or extension wire is tested against standard wires that have been certified by the National Bureau of Standards. Checks are made at numerous points throughout the temperature range of the calibration in which the wire will be used. Every spool of wire meets rigid standards before it is accepted. Calibration figures are tagged on each spool.

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Ask your Honeywell Supplies Man to give you complete facts about Brown thermocouple and extension wires . . . and to tell you how the HSM Plan can bring you new convenience and economy in all your purchasing of pyrometer supplies. Call him today at your local Honeywell office . . . as near to you as your phone.

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MINNEAPOLIS **Honeywell**
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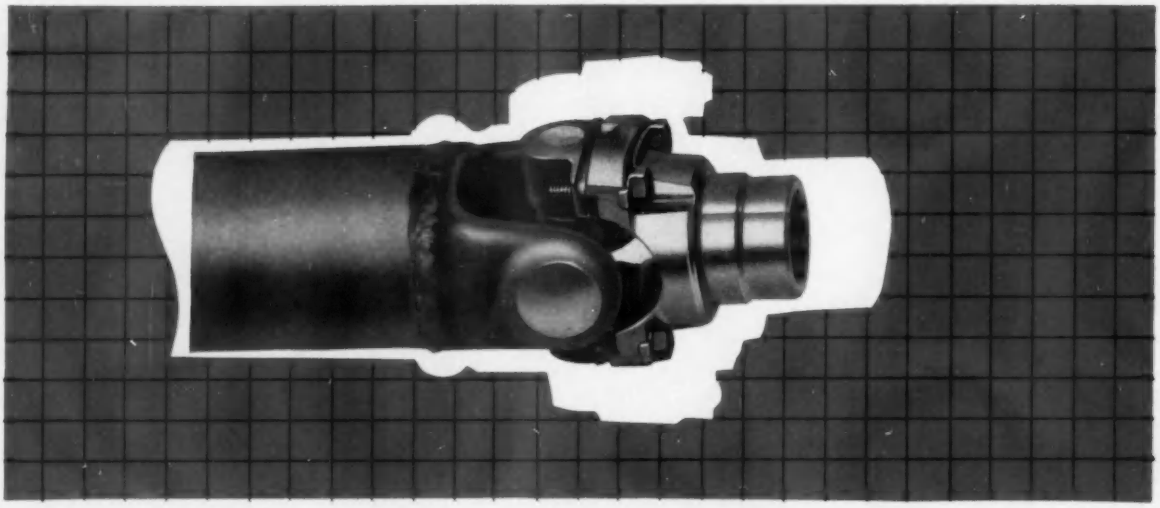

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2. **SMALLER**—3-9/16" swing diameter. This NEW joint requires less clearance, making possible more compact design.

3. **LIGHTER**—This NEW joint weighs 20% less than previous joints having the same torque capacity.

4. **EASIER TO INSTALL**—This NEW joint saves time and money on the assembly line because it has less parts to handle.

Give your next car the benefit of the 4 advantages provided by this NEW joint development. Let MECHANICS engineers help you design power transmission lines better suited to the low floor board, more powerful engine and higher speed requirements of your future models. Send print and specifications—for their prompt recommendations.

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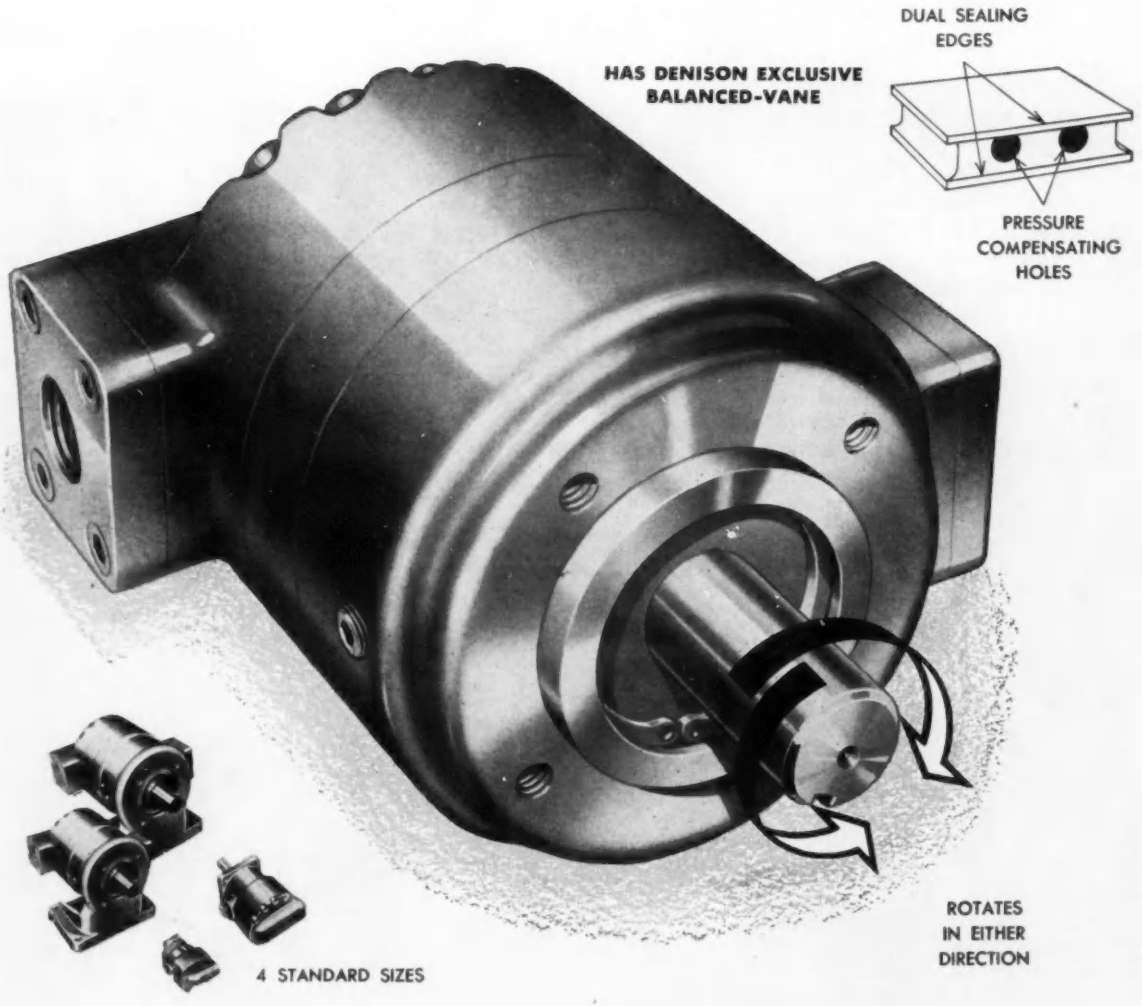

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IT'S A PUMP—high delivery in a small, compact package . . . a continuous 2000 psi pump.

IT'S A MOTOR—high stalled torque up to 257 pound-inches per 100 psi. Takes high shock pressures without danger.

EXCLUSIVE—Denison *Radially Balanced* Vane; *Cuts wear* between cam ring and vane; *Increases efficiency* with dual sealing edges; *Reduces pulsation* by radial pumping action of vanes.

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EITHER DIRECTION—Operates efficiently as a pump or motor without change in piping. Minimum internal friction in either direction because of greatly reduced contact pressure between vanes and cam ring.

STANDARD SIZES—as a pump, Range of delivery 2.5 to 77 gallons per minute at 2000 psi.
As a motor, Horsepower output 1 to 103 hp at 2000 psi.

MORE INFORMATION—Send for Bulletin P-5-A giving complete specifications. Write . . .

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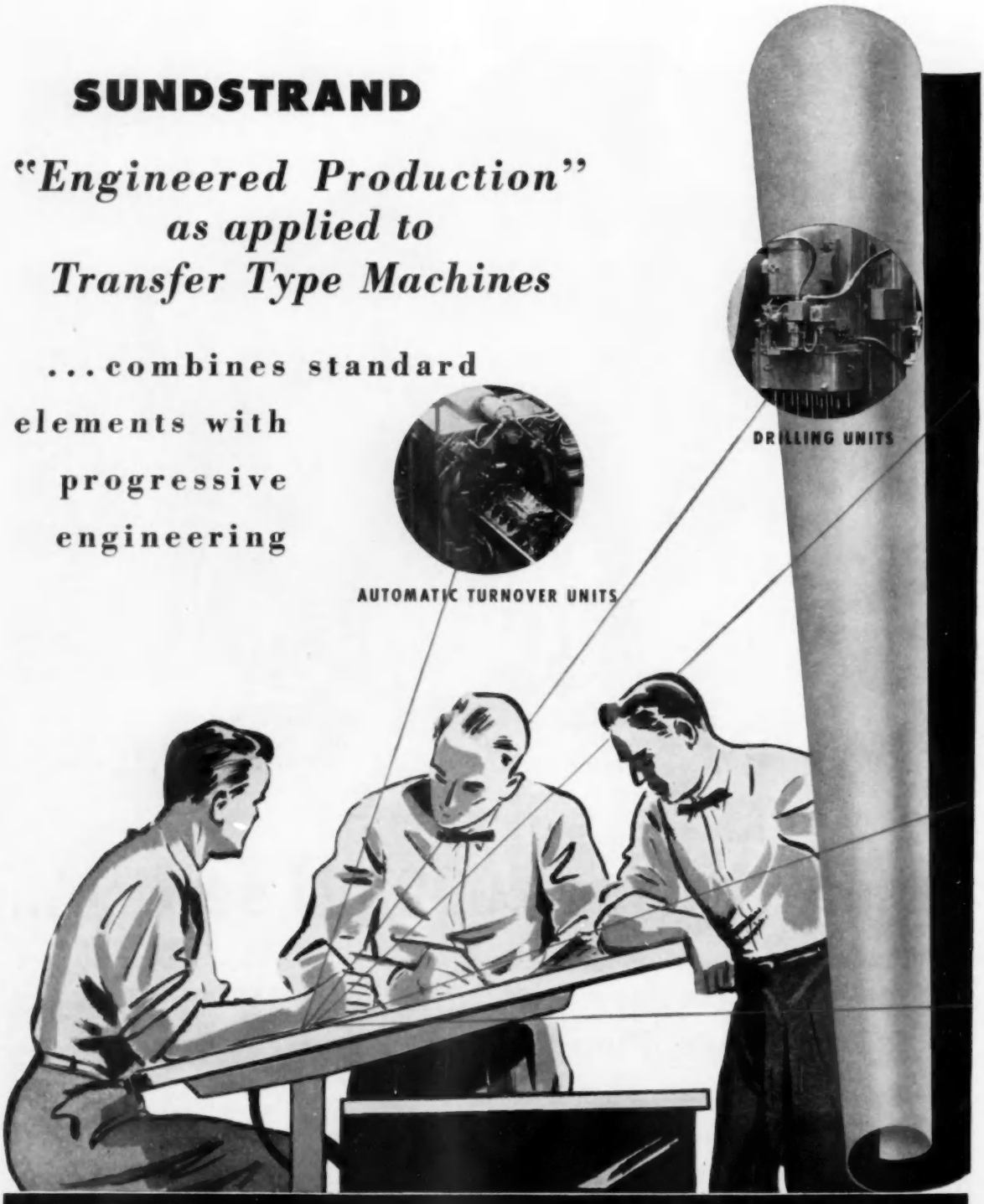

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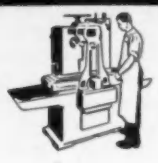
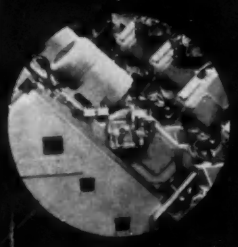
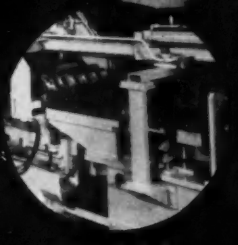


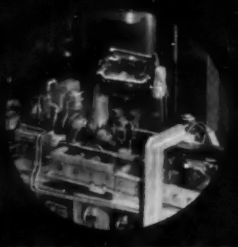


BORING UNITS

The example below is of a Sundstrand twenty-nine station transfer type machine for milling, drilling and boring operations on cylinder blocks. This, as well as other Sundstrand transfer type machines, is the result of combining standard and semi-standard elements with Sundstrand "Engineered Production" experience.

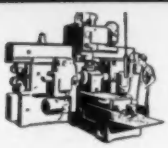


AUTOMATIC INDEXING UNITS

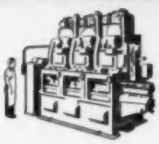


AUTOMATIC CHIP DUMPS

TRIPLEX RIGIDMILS



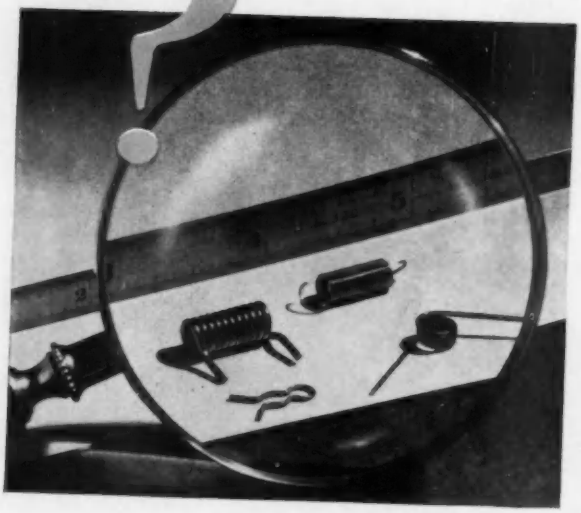
SPECIAL MACHINES



SUNDSTRAND
Machine Tool Co.
2571 Eleventh St. • Rockford, Ill., U.S.A.

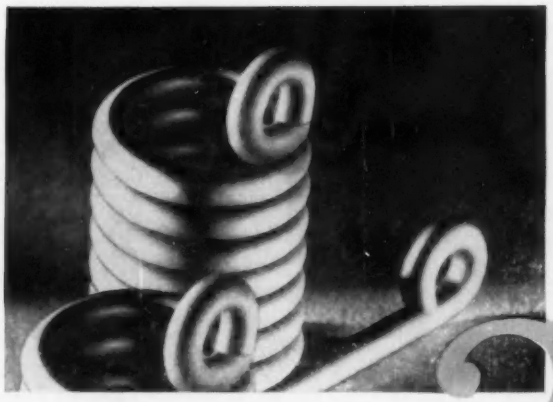
BIG springs?

-little springs?



-simple springs?

Get custom-made performance and volume prices with American Quality Springs



-tricky springs?

SOME OF OUR BEST CUSTOMERS still find it hard to believe that American Steel & Wire can turn out such an incredible variety of springs: we make extension springs, compression springs, torsion springs, motor springs, flat spiral springs, flat springs, and wire forms with an endless variety of end formations. Cold wound and heat treated.

Materials? Carbon steel wire, hard drawn, oil tempered and annealed, music wire, chrome-vanadium wire, Stainless Steel, monel, phosphor bronze, brass or just about any other spring metal you can name.

Finishes? Springs can be supplied ground, polished, shot blasted, ball blasted; coated with japan, lacquer, zinc, cadmium, copper, nickel or just about any other material that can possibly be applied.

American Steel & Wire can supply completely fabricated spring assemblies, too. A complete assembly department can produce, *at low cost*, such items as parking brake assemblies.

Take advantage of our complete spring engineering design service, this great range of varieties; get rapid delivery and low prices—with American Quality Springs. Just call your nearest AS&W salesman.

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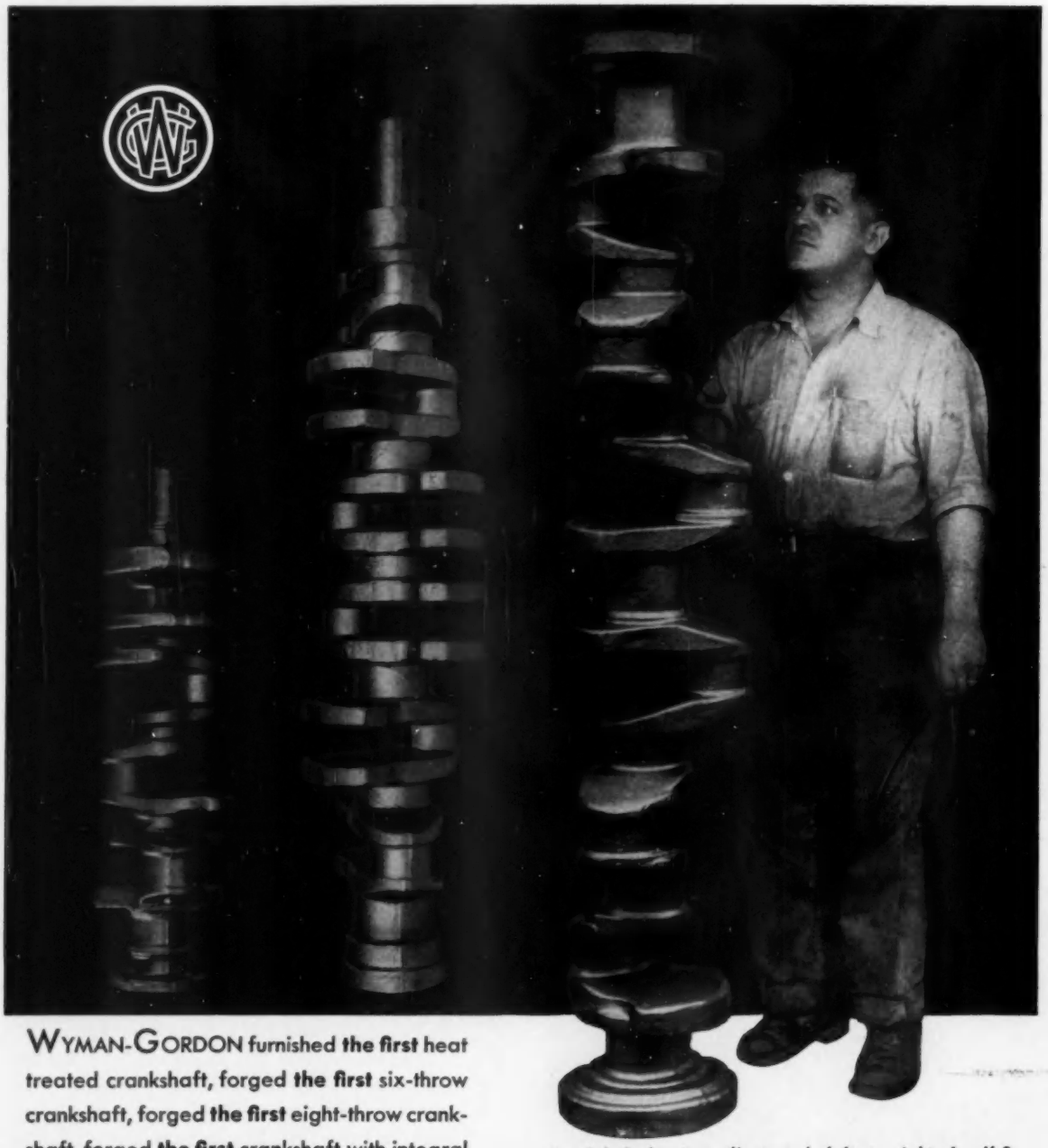
USS AMERICAN QUALITY SPRINGS

UNITED STATES STEEL



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In a crankshaft there is no substitute for a forging, and in a forging there is no substitute for Wyman-Gordon quality and experience.

Crankshaft forgings illustrated, left to right, for V-8 passenger car, diesel truck and heavy tractor engines

WYMAN-GORDON CO.

Established 1883

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STEEL • TITANIUM

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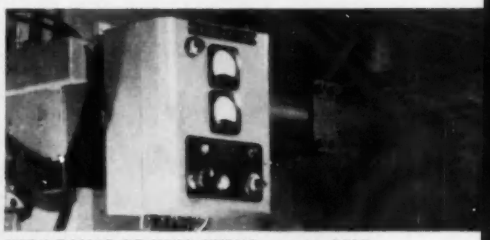
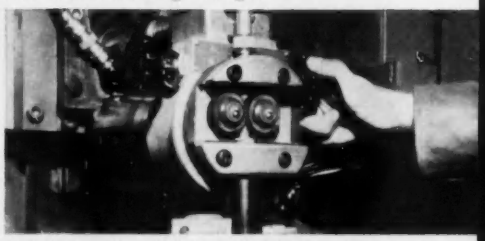
HARVEY, ILL. • DETROIT, MICH.

NEW G-E Automatic Welding Equipment Matches Speed of Any Production Line

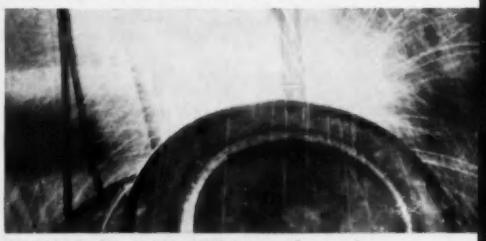
FILLERARC METHOD FEEDS FILLER WIRE AT ANY SPEED UP TO 1000 INCHES PER MINUTE



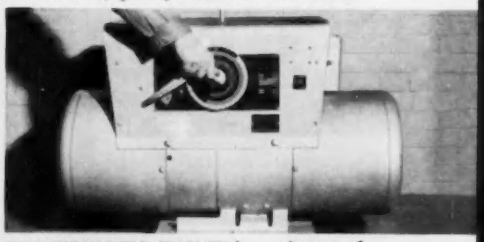
WIDE RANGE OF WIRE SPEEDS—up to 1000 inches per minute—makes this G-E system flexible enough for any production line. Speed is constant since system is insensitive to normal line-voltage changes.



FLEXIBILITY OF FILLERARC SYSTEM is also demonstrated by the automatic head. It rotates 360°, allowing even overhead welding. Arc is completely visible since gas instead of flux is used as the shield.



CIRCULAR OR SEAM WELDS may be made on stainless steel, copper, aluminum, and other metals—using inert gas. Fillerarc generator and carbon dioxide gas combine for low-cost, quality welds on mild steel.

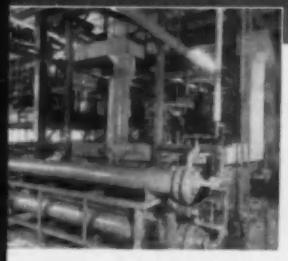


CONSISTENT WELD QUALITY is a primary advantage of the G-E Fillerarc generator. It is self regulating and features a rising volt-amp curve which matches the arc curve—for reliable in-line operation.

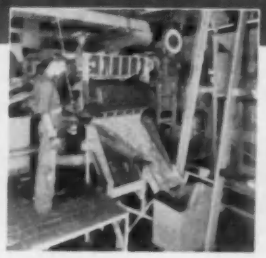
For details, write for bulletin GEC-1334, Section 713-2, General Electric Co., Schenectady, N. Y., or call your G-E Welding Distributor.

GENERAL ELECTRIC

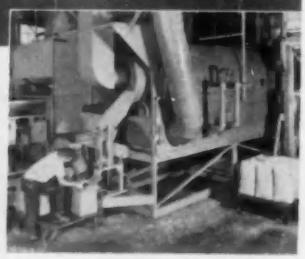
PLATING 400,000 POUNDS A DAY
WITH THIS **UDYLITE** MACHINE . . .



End view showing exhaust system and heat exchangers.



Unloading station of Udylite Automatic Barrel Machine.



Drum type dryer used for drying bright zinc plated work.

Harding Manufacturing Company are bright zinc plating 20,000 pounds of small parts per hour with their Udylite Full Automatic Barrel Plater and are running it 20 hours a day.

Only four men are used in operating this Udylite machine. One man loads the feeder hopper. One man loads the cylinders. One man unloads the cylinders and one man unloads the dryer and dichromating operation—*5,000 pounds of plating per man hour.*

And with this tremendous production is all the desired versatility. The machine is so designed with electrical controls that the plating time and thickness of plating in each cylinder load can differ from other loads going through the machine cycle at the same time. The plating time for each load is predetermined by the operator at the time the cylinder is loaded.

This is another example of Udylite experience in production plating. If you have a plating problem—large or small—it will pay you to consult Udylite.

THE Udylite CORPORATION
DETROIT 11, MICHIGAN

WORLD'S LARGEST PLATING SUPPLIER

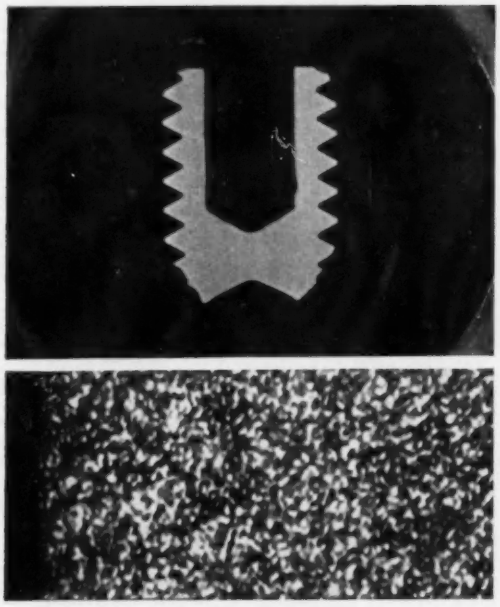
CALENDAR

OF COMING SHOWS AND MEETINGS

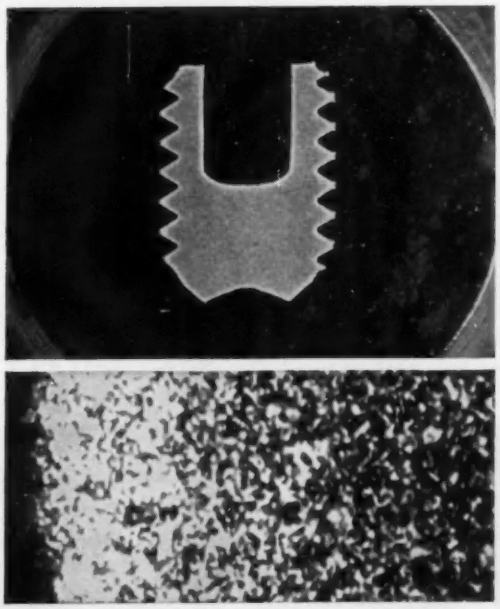
Turbojet Engine Hydraulics Symposium, Park Sheraton Hotel, Detroit, Mich. ..... Feb. 2-3
Automotive Accessories Mfgrs. of America Exposition, Navy Pier, Chicago, Ill. ..... Feb. 6-9
SPI Reinforced Plastics Div. Conference, Hotel Chalfonte-Haddon Hall, Atlantic City, N. J. Feb. 7-9
Private Truck Council of America Convention, Cleveland Hotel, Cleveland, O. ..... Feb. 9-10
NSPA Convention, Mark Hopkins Hotel, San Francisco, Calif. Feb. 21-22
Pacific Automotive Show, Civic Auditorium, San Francisco, Calif. ..... Feb. 23-26
Amsterdam Automobile Show Feb. 23-Mar. 4
Copenhagen Automobile Show Feb. 24-Mar. 4
Leipzig Fair, Germany .... Feb. 26-Mar. 8
AMA Electronics Conference, Hotel Commodore, New York, N. Y. Feb. 27-29
ASTM Spring Meeting, Hotel Statler, Buffalo, N. Y. ..... Feb. 27-Mar. 2
SAE National Passenger Car, Body, and Materials Meeting, Hotel Statler, Detroit, Mich. ..... Mar. 6-8
Geneva Automobile Show, Switzerland ..... Mar. 8-18
Vienna Automobile Show ..... March 11-18
National Association of Corrosion Engineers, annual convention, Hotel Statler, New York, N. Y. Mar. 12-16
Pressed Metal Institute, spring technical meeting, Hotel Carter, Cleveland, O. ..... March 14-16
Association of National Advertisers, spring meeting, Homestead, Hot Springs, Va. ..... Mar. 14-16
American Institute of Industrial Engineers, Conference on Automatic Controls, Cleveland, O. Mar. 15-16
Stockholm Automobile Show. March 16-25
SAE National Production Meeting and Forum, Hotel Statler, Cleveland, O. ..... Mar. 19-21
ASTE Industrial Exposition, International Amphitheatre, Chicago, Ill. ..... Mar. 19-23
ASLE Annual Meeting, William Penn Hotel, Pittsburgh, Pa. . April 4-6
SAE Aeronautic Meeting and Production Forum, and Aircraft Engineering Display, Hotel Statler, New York, N. Y. . . April 9-12
National Packaging Exposition, Convention Hall, Atlantic City, N. J. ..... April 9-12
MPA Annual Meeting and Metal Powder Show, Hotel Cleveland, Cleveland, O. ..... April 10-12
National Petroleum Institute, semi-annual meeting, Cleveland Hotel, Cleveland, O. ..... April 18-20
Turin Motor Show, Italy . . April 21-May 2
British Industries Fair, London and Birmingham, England . April 23-May 4
International Automobile Show, Coliseum, New York, N. Y. April 28-May 6
Chamber of Commerce of the U. S., annual meeting, Washington, D. C. ..... April 30-May 2
AFS Castings Congress and Show, Atlantic City, N. J. ..... May 3-9
AWS Spring Meeting and Fourth Welding & Allied Industry Exposition, Buffalo, N. Y. ..... May 8-11
Design Engineering Show, Convention Hall, Philadelphia, Pa. . May 14-17

New heat-treatment methods help High-Torque Unbrako socket set screws withstand up to 40% Higher Torques

UNBRAKO SET SCREW



ORDINARY SET SCREW



—you can set them and forget them

Research had proved that the tighter you seat a set screw the better it works. So we developed a set screw that could be tightened tighter than ever before without damaging the screw. One of the problems was developing new methods of heat treatment to eliminate decarburization. Decarb of course plays havoc with a screw. Put a wrench in the socket and you ream it. Run the screw into a tapped hole and you strip its threads. Try to seat it and its point shears off. These photographs are a study in contrasts. The UNBRAKO is clean, its grain uniform. There is no decarburization —the ordinary set screw is suffering from an overdose of it, socket walls, threads and point are full of the telltale white spots.

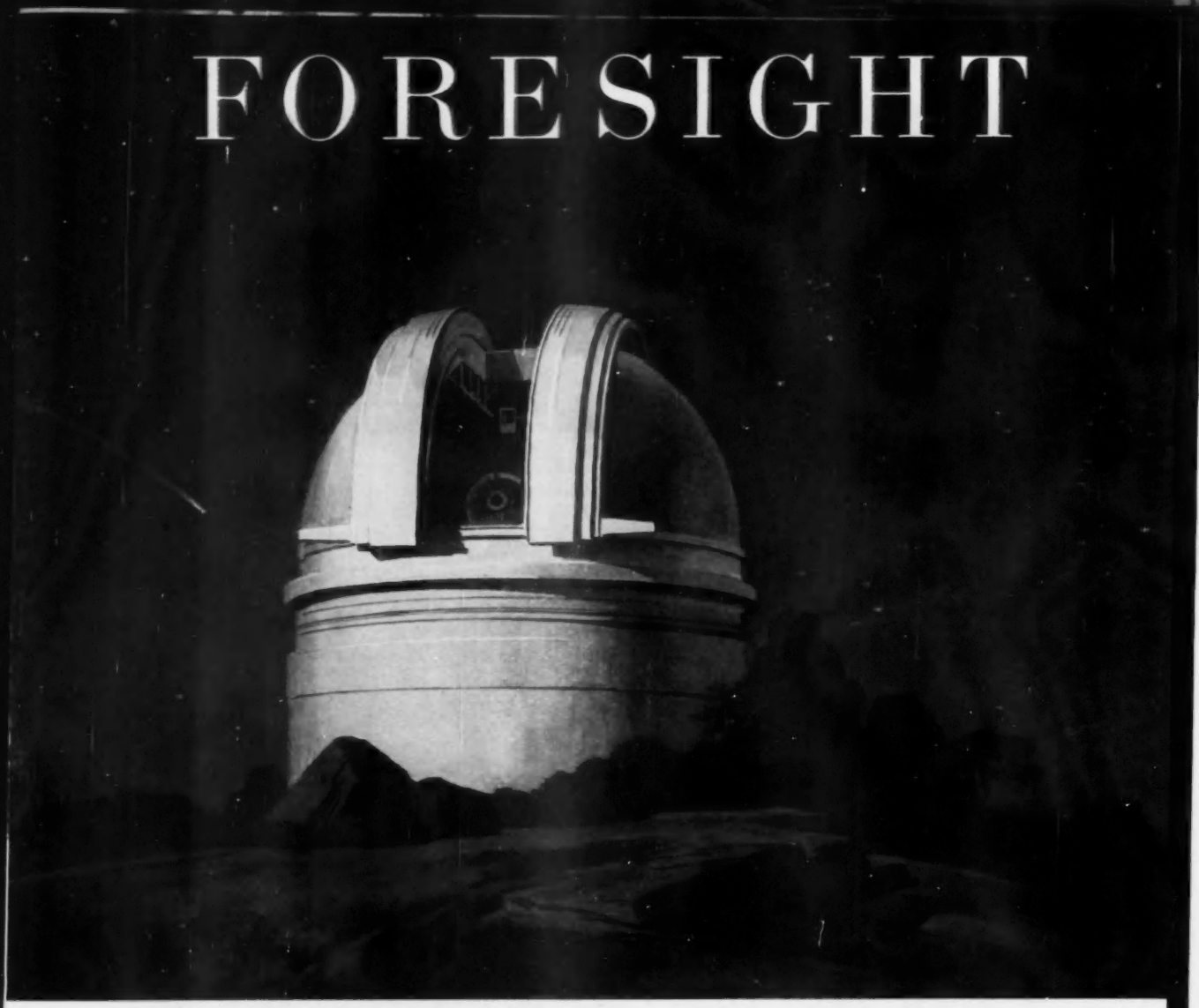
You can't buy a better screw than an UNBRAKO. And you can't get full *high-torque* performance without a "High-Titan" UNBRAKO Hex Key—the high-ductility, precision internal wrenching tool. See your industrial distributor. Or write STANDARD PRESSED STEEL CO., Jenkintown 53, Pa.

RECOMMENDED SOCKET SET SCREW TIGHTENING TORQUES
(Inch-Pounds)

SCREW SIZE	UNBRAKO	SET SCREW B	SET SCREW C	MINIMUM DIFFERENTIAL %
#4	5	3.9	3.5	28
#5	9	7.8	7.4	15
#6	9	7.8	7.4	15
#8	20	14.7	14.5	36
#10	33	26.5	25	25
1/4	87	62	60	40
5/16	165	122	125	32
3/8	290	198	225	29
7/16	430	309	350	23
1/2	620	460	500	24
5/8	1225	1106	1060	11
3/4	2125	1540	1800	18
7/8	5000	3660	4600	9
1	7000	5025	6500	8

STANDARD PRESSED STEEL CO.
UNBRAKO® SOCKET SCREW DIVISION SPS
JENKINTOWN PENNSYLVANIA

FORESIGHT



Planning for tomorrow • Producing for today!

Since the earliest days of the industry, Bendix foresight in product design and development has contributed materially to automotive progress.

For example, Bendix* power braking and power steering, two of the industry's most popular new car features, are the results of years of research and engineering by Bendix specialists in these important fields.

Today Bendix engineers are likewise busy planning and developing new and better products to meet the needs of the years ahead.

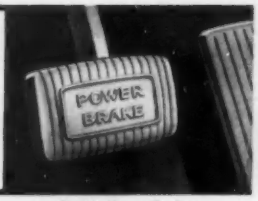
It is because of this foresight the automotive industry looks to Bendix for components that continue to lead in public acceptance and dependable performance.

*REG. U.S. PAT. OFF.

BENDIX PRODUCTS DIVISION **SOUTH BEND** INDIANA

Export Sales: Bendix International Division, 205 East 42nd Street, New York 17, N. Y.

TYPICAL EXAMPLES



Bendix Power Brakes

Bendix Power Steering

Bendix Products Division

Bendix AVIATION CORPORATION

BRAKES • POWER STEERING • POWER BRAKING • CONSTANT VELOCITY UNIVERSAL JOINTS • HYDRAULIC REMOTE CONTROLS

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High Spots of This Issue

★ Buick's New Axle Department

With the advent of a redesigned rear axle and drive line, Buick has introduced an entirely new axle department incorporating advanced machinery and materials handling. A sampling of the operations is presented here. Page 48.

★ Thornton Powr-Lok Differential

This is the locking type differential offered on 1956 Packards. Distinctive among its features is that partial torque transfer is supplied to the wheel with poor traction, besides traction torque to the non-spinning wheel. Page 52.

★ Latest Developments in Ford Automation Techniques

Cleveland Engine Plant No. 2 is a striking illustration of the employment of automation techniques. Described are engine assembly operations included in a network of conveyor systems running some 8000 ft in length. Page 54.

★ Highlights of 1956 Chevrolet Trucks

The 1956 line of Chevrolet "Task Force Trucks" comprises 75 models, available on 15 different wheelbases. Heading the list of features are a brand new six-speed automatic transmission and nine more-powerful engines. Page 59.

★ Annual Meeting of the SAE

All attending SAE's annual meeting were well rewarded by the wealth of knowledge dispensed in a program encompassing a wide range of subjects. Summarized and extracted here are a number of the many interesting topics. Page 60.

★ 45 New Product Items And Other High Spots, Such As:

Unique cylinder block design; special storage and handling reduce truck costs; large rings made automatically; plastic dies facilitate model changes; fan clutch unit; transmission air assist control; and new vehicles from Communist countries.

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Automotive and Aviation News, Page 33

AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES
• BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY •
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT
SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
ENGINEERING • PRODUCTION • MANAGEMENT

Just Push a Button...

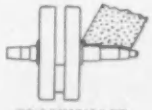
Push-button grinding saves operator effort and reduces cost. Four diameters, three radii and two shoulders are ground on steering knuckles at the rate of 96 per hour.

diameter and adjacent shoulder are ground automatically

CINCINNATI FILMATIC 14" L x 36" Semi-Automatic Angular Wheel Slide GRINDING MACHINE

TRANSMISSION DRIVE GEAR

STEERING KNUCKLE



CRANKSHAFT

TRANSMISSION EXTENSION

Pushing a button to perform useful work is a good habit to acquire. It's such an easy way to do a better job at lower cost. The operator of the new CINCINNATI FILMATIC Angular Wheel Slide Grinder, illustrated above, pushes a single button and eleven events follow automatically:

1) Table clamped in position
2) Wheelhead rapidly advances
3) Grinding fluid turned on
4) Work rotation starts
5) Work ground at "coarse" feed rate
6) Grinding feed rate changes to "fine"
7) Tarry
8) Wheelhead rapidly returns
9) Work rotation stops
10) Grinding fluid shut off
11) Table unclamped

To support this fine semi-automatic performance (loading and unloading are manual) the machine is equipped with automatic grinding wheel balancing, an exclusive Cincinnati feature that promotes the finest finish and saves hours of time. Of course, the spindle is mounted on the famous CINCINNATI FILMATIC bearings, the bearings of perpetual youth. And three cost-reducing types of equipment are available as extras:

Automatic electric gage sizing with automatic compensation for wheel wear
Behind-the-wheel profile truing
Simple, effective flagging

Would you like to know more about CINCINNATI FILMATIC Semi-Automatic Angular Wheel Slide Grinding Machines? Ask for catalog No. G-647.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 114, No. 3 February 1, 1956

Chrysler Breaks Ground For Huge Stamping Plant

Chrysler Corp. last month broke ground for its new automotive stamping plant in Twinsburg, O. The multi-million dollar facility, largest of its kind in the country, will have 28 lines of stamping presses consisting of about 260 machines.

More than half of the outlay for the plant will go for machinery, including the latest material handling devices. It will bring to seven the number of stamping plants to be operated by the Automotive Body Div., which provides body stampings and assemblies for Chrysler Corp. plants in Michigan, Indiana, and California.

Corvette Engine Offered On Entire Chevrolet Line

The 225-hp V-8 engine used in the new Corvette sports car (See A. I., Jan. 15, p. 64) is being made available for 1956 Chevrolets. It brings to five the number of engines offered on Chevrolet's line of cars, including four V-8 power plants and one six-cylinder unit. Features of the Corvette engine, which has a compression ratio of 9.25 to 1, are twin four-barrel, eight-jet carburetors, special highlift camshaft, mechanical valve tappets, two-breaker distributor, and streamlined exhaust manifolds.

Plymouth Chalks Up Gains In Certain Market Areas

Although Plymouth last year failed to recapture third place from Buick in retail car sales, it made considerable headway as far as market penetration is concerned in certain areas of the country. In some larger cities Plymouth raised its share of the total industry market to as much as 14 per cent. The division's overall penetration climbed to approximately 9.1 per cent. Total retail sales hit an all-time high of 675,000 units, more than 85 per cent above 1954.

BRITISH MILITARY AND CROSS-COUNTRY VEHICLE

Twin engines on this five-ton tractor, built by Nicholas Straussler & Co., Ltd., provide road speeds of up to 50 mph. Optional Diesel or gasoline power plants furnish a total output of 180 or 120 hp, respectively, and can be used together or separately. Drive from a common shaft is through a five-speed gearbox and a two-speed transfer case to both axles. Special Straussler-"Lypsoid" tires are 44 by 28 with 20¾ in. rim.

Bendix Aviation Reports Peak Net For Fiscal Year

Despite a decline in defense production and total sales, Bendix Aviation Corp. showed a record net income of $25.8 million for the year ended Sept. 30, 1955, slightly above the $25.5 million net in the previous year. Sales dropped by about seven per cent to $567.2 million from $607.7 million, although automotive sales climbed by 25 per cent to a new record total of $110 million.

Aviation products accounted for 63 per cent of the total volume. Automotive products rang up 20 per cent, while industrial and miscellaneous military items accounted for the remaining 17 per cent.

Pontiac Introduces 285-Hp V-8 As Limited Production Option

A new 285-hp Strato-Streak V-8 engine has been developed and made available as optional equipment on 1956 Pontiacs. The special engine with a compression ratio of 10:1 exerts a maximum torque of 330 ft lb. It has twin four-barrel carburetors and special intake manifold.

Special camshaft, valve-lifters and inner valve springs, ignition coil, and distributor are used in the engine. Either the Pontiac Strato-Flight Hydra-Matic or Synchromesh transmission can be used with the more powerful V-8.

The limited production of the new power plant is said to be intended primarily for sports car and stock car racing enthusiasts. The engine is available on all Pontiac models and will be installed in cars built at the main plant in Pontiac, Mich.

News of the AUTOMOTIVE

FORD DREAM CAR FEATURES AERODYNAMIC STYLING

Held here by George W. Walker, vice-president and director of styling for Ford Motor Co., is a three-eighths-scale Fiberglas model of the new X-1000 dream car. To be featured in a Ford styling exhibit at the Detroit Automobile Show Feb. 18 to 26, the car is said to be inspired by today's supersonic jet fighter planes. Provisions have been made to accommodate any of several possible new types of power plants.

Reynolds Gets Contract From Ford For Aluminum

A contract to deliver more than 640 million lb of aluminum to Ford Motor Co. in the next 10 years has been signed by Reynolds Metals Co. It is believed to be the biggest industrial aluminum order in history.

Under the contract, most of the aluminum will be delivered in molten form direct from a new Reynolds reduction plant in Listerhill, Ala., to a Ford foundry to be built adjacent to it. The aluminum plant will be built at a cost of between $75 million and $80 million, and construction is expected to start shortly. The new aluminum plant, Reynolds' seventh, will bring the company's total annual capacity to more than 1.1 billion lb.

MASERATI MODEL BUILT FOR TOURING

The Maserati A6G2000 touring car is powered by a six-cylinder engine with an output of 120 bhp at 6000 rpm and a compression ratio of 8 to 1. Built on a wheelbase of eight ft, 3.45 in., the vehicle has such other features as a gearbox with four forward speeds and one reverse and an independent front suspension.

Quadruple Headlamps Ready For Some 1957 Model Vehicles

Four headlamps on passenger cars will be introduced later this year on some 1957 models. First to have them, according to reports, will be Cadillac's El Dorado.

The automobile industry is seeking legislative or administrative approval in states where the multiple lights have not been legalized. Although stylists have been the principal pushers for the quadruple lamps, some engineers are convinced that better lighting is possible by using one set of lamps for high-beam operation and a separate set for low-beam driving.

Plymouth Notes Rise In Sales Of Taxicabs

Indicative of the growing fleet sales market is a report from Plymouth. Since the division introduced its new taxicab models on Oct. 21, 1955, it has built more than 3200 of the units for fleets throughout the country.

The total figure is about 1½ times larger than that of a comparable period a year earlier. Plymouth builds the taxicabs as a separate line of cars with certain special heavy-duty equipment required by cab companies.

Euclid Plans To Acquire Ohio Site For New Plant

Euclid Div. of General Motors Corp. plans to acquire a 423-acre site at New Hudson, O. for construction of a new plant. No further details were given about the proposed plant. The area, however, still has to be re-zoned before any manufacturing facility can be located there.

Kennametal Subsidiary In Ohio Gets New Name

Kennametal Co. of Ohio is the new name of the concern formerly known as T. R. Almond Manufacturing Co. Located in Willoughby, O., the company is a wholly owned subsidiary of Kennametal, Inc. The Willoughby plant manufactures mechanical tools.

AND AVIATION INDUSTRIES

Three-Speed Automatic Shift Ready for Chrysler Imperial

Chrysler Div. shortly will offer a new three-speed automatic transmission in its Imperial lines only as an extra cost option. The new transmission is said to provide smoother operation, much faster acceleration in the lower speed ranges, and improved fuel economy.

The unit combines a hydraulic torque converter and a three-speed planetary gearbox. Overall torque ratio is 6.6 to 1, reportedly the highest in the industry. Automatic downshift to second range below 70 mph and to first range below 25 mph are possible by depressing the accelerator pedal to the floor.

Chrysler Div. has not disclosed whether or not the new transmission will be extended eventually to its other lines of cars, but such a possibility cannot be overlooked. It may also appear on cars of other Chrysler Corp. divisions at some later date.

Belgian Company Is Formed To Make Macks for Europe

The formation of Mack Belgium, S. A., to manufacture, assemble and distribute Mack trucks, buses, trolley buses, and Diesel engines throughout Europe has been disclosed. The announcement was made jointly by Mack and Electro Rail, S. A., of Belgium.

The agreement between Mack and the Belgian company is said to have been made to fulfill the continued demands for Mack equipment from European contractors, truckers, and other heavy-duty vehicle users. The formation of the new company will facilitate the distribution and service of these vehicles in Europe.

Large 1956 Trailer Market Is Predicted by Fruehauf

Roy Fruehauf, president of Fruehauf Trailer Co., predicts a big market for trailer models this year. He estimates that his company's sales in 1956 will approximate $350 million, about 50 per cent above last year. He credits the higher volume to "piggybacking" and development of new models.

To meet the anticipated increase in sales this year, Fruehauf is continuing to expand its own facilities and acquire new ones. Two of its latest acquisitions include Hobbs Mfg. Co. in Ft. Worth, Texas, and Strick Trailer Co., Philadelphia.

NOVEMBER CUTS SALES BUT YEARLY RECORD NEARS

1955 New Passenger Car Registrations*

Arranged by Makes in Descending Order According to the 1955 Eleven Months' Totals

MAKE	November 1955	October 1955	November 1954	ELEVEN MONTHS Units 1955	Units 1954	Per Cent of Total 1955	Per Cent of Total 1954
Chevrolet	121,205	139,822	104,274	1,479,529	1,225,395	22.60	24.97
Ford	130,397	130,936	90,267	1,429,580	1,234,358	21.84	25.15
Buick	34,271	62,188	26,715	679,717	464,474	10.39	9.47
Plymouth	40,686	42,418	19,918	597,410	336,815	9.13	6.86
Oldsmobile	37,008	47,165	24,520	538,433	368,318	8.23	7.51
Pontiac	38,815	40,323	38,197	486,873	318,019	7.44	6.48
Mercury	29,566	31,437	16,570	342,121	251,934	5.23	5.13
Dodge	20,743	26,336	11,903	263,849	135,486	4.03	2.76
Chrysler	10,850	10,011	7,558	143,572	88,705	2.19	1.81
Cadillac	11,761	5,406	5,961	125,726	95,908	1.92	1.97
De Soto	8,326	7,845	5,588	107,948	67,968	1.65	1.39
Studebaker	5,109	7,069	9,679	88,805	86,727	1.36	1.77
Nash	5,683	7,648	5,745	87,603	77,170	1.34	1.57
Packard	3,625	4,458	2,426	48,147	36,856	.74	.75
Hudson	2,229	3,128	2,910	40,578	32,644	.62	.67
Lincoln	3,421	3,507	2,413	30,969	33,765	.47	.69
Willys	217	292	1,236	6,092	16,748	.09	.34
Kaiser	16	22	721	925	6,756	.01	.18
Continental	200	129		329		.01	
Misc. Domestic	22	14	58	301	3,287		.07
Foreign	4,909	5,891	2,402	46,547	22,804	.71	.46
Total—All Makes	509,155	576,045	381,081	6,545,054	4,907,137	100.00	100.00

* Based on data from R. L. Polk & Co.

New General Tire Plant To Be Enlarged Further

A 50 per cent increase in facilities is being planned for General Tire & Rubber Co.'s new plant in Ashtabula, O. The $6 million unit, which started operations about a year ago, manufactures polyvinyl chloride resin.

BLOWERS FOR DIESEL UNITS

Turbo-blowers in seven sizes for pressure charging and scavenging two and four-stroke Diesel engines are now produced by D. Napier & Son, Ltd. Each has a single-stage axial-flow turbine on a common shaft with the centrifugal compressor. The housings consist of four interchangeable and multi - positional castings bolted together. Resilient mounting of the bearings insulates the rotor from engine vibration.

News of the AUTOMOTIVE

PLASTIC RADOME FOR NAVY SKYRAIDER

Radome half for the Navy AD-5W Skyraider is shown being lifted from curing mold at Douglas Aircraft Co. The halves are permanently joined into a one-piece unit by laminating alternating fabric of glass fibers from each half about a plastic honeycomb structure. No metal that could interfere with a radar picture is required in the joint.

GM Backs Up Its Faith in 1956 with $1 Billion

General Motors Corp. will spend more than $1 billion in 1956 for capital expenditures. It will be the largest such expenditure by GM in history for any one year and represents a 65 per cent increase over the approximately $600 million GM spent last year.

The money does not, however, constitute a large increase in planned expenditures or those previously announced, since it will basically represent expansion under previously announced programs. When completed, the GM program of capital investment since the end of World War II will have totaled $4.5 billion.

Second Best Year Possible

Harlow H. Curtice, president of GM, announced at a luncheon for industrialists in New York preceding the opening of the 1956 Motorama that the automobile industry this year can enjoy the second best production and sales year in its history. He estimated that the industry will produce and the domestic market will absorb 7.5 million cars and trucks in 1956. His estimate, however, did not take into account vehicles for the export market.

He attributed the phenomenal performance of the automobile industry last year to a favorable economic climate and to an entirely unexpected contra-seasonal demand for automobiles experienced in the last half of the year.

Economy to Hit New Heights

Mr. Curtice was extremely optimistic about prospects for the economy for the country as a whole, in predicting that gross national production this year will increase about four per cent to a new high in excess of $400 billion. He added, however, that the rate of gain in 1956 is expected to be somewhat less than that experienced in 1955.

Among other reasons for forecasting continued prosperity this year, Mr. Curtice cited the continuing uptrend in new construction of both residential and commercial property and a new high of about $32 million in capital expenditures by industry to represent an increase of 15 per cent over last year. In addition, he predicted that defense and other spending by Federal, state and local governments will be somewhat higher this year.

Cars Prized by Consumers

Mr. Curtice cited some interesting statistics on the relationships between consumer expenditures for automobiles to that expended for other products. Last year, he said, retail sales of passenger cars to consumers rose 38 per cent over the previous year, whereas total expenditures by consumers rose only seven per cent.

Retail passenger car sales to consumers were about 5½ per cent of total consumer expenditures, compared to about four per cent for the earlier postwar years and a pre-war average of less than three per cent. He said that the percentage of consumer spending for automobiles this year may not reach the record level of 1955 but that the automobile industry will contribute importantly to the general prosperity of 1956.

Another factor, which may affect automobile sales this year, Mr. Curtice said, is the current policy of the Federal Reserve. In his opinion, it is restricting credit from the standpoint of cost and availability and may offer less support to sales this year than it did in 1955.

Bendix Radio Forming Four New Departments

The Radio Div. of Bendix Aviation Corp. is setting up four new departments to coordinate better its activities with various industries and the Government. First to be established is an Aviation Dept., under which will be consolidated all activities concerned with the company's commercial aviation products. The three other departments to be formed under a similar basis will be automotive, mobile, and Government products.

AND AVIATION INDUSTRIES

STINGING SCORPION

Two of these honey-combed cigar-like pods, mounted on the tip of each wing of the Northrop Scorpion F-89D all-weather interceptor, serve as launching platforms for 2.75 in. air-to-air rockets. The plane carries a total of 104 of these rockets which are fired electronically once the F-89 has made radar contact.

Ford Offers 230-Hp Engine On Fairlane, Thunderbird

Ford is offering a 230-hp engine as optional equipment on the Fairlane and Thunderbird series. The engine is modified for high performance through use of two four-barrel carburetors and changes in the manifold and camshaft. Compression ratio also has been stepped up.

Firebird II Air Conditioning Product of Harrison Research

The air conditioning system in the GM Firebird II (see AI, Jan. 1, p. 36) represents the culmination of much engineering research on the part of Harrison Radiator Div. of General Motors Corp. The experimental Harrison system has such features as air conditioned front and rear compartments, an ice-water drinking fountain, new types of temperature controls and filtered outside air.

Special controls provide even and continuous cooling throughout the Firebird II. Air is kept on the move with a change for all passengers every 20 seconds.

AI TABLOID

Chrysler Div. of Chrysler Corp. has set a factory retail price of $3,997 on its new 300B car.

* * *

Champion Spark Plug Co. will build a new assembly plant in Burlington, Iowa. . . . Boyertown Auto Body Works is constructing a new building which will give it a 25 per cent increase in production facilities for its truck bodies.

* * *

Temco Aircraft Corp. has developed a dual purpose military trainer for primary flight and armament instruction. It is powered by a 340-hp Lycoming engine.

* * *

Fruehauf Trailer Co. has been selected by the California Institute of Technology for a joint program of engineering research and development of electronic trailer specifications.

* * *

Singer Motor Co. has become a member of the Rootes Group. . . . Rootes Motors of Canada, Ltd., and R. A. Lister & Co., Ltd., have formed a new concern—Canadian Lister-Blackstone, Ltd.

* * *

National Automatic Tool Co., Inc., has appointed Farson, Hull & Northlich, Inc., as its advertising and public relations counsellor.

* * *

Napco Industries, Inc., has set aside February 16 to mark the formal opening of its new Federal Motor Truck Div. in a new plant at Minneapolis, Minn.

* * *

Caterpillar Tractor Co., Ltd., of Great Britain, will break ground soon for a 500,000 sq ft plant at Glasgow, Scotland, for production of Caterpillar crawler tractors.

* * *

American Brake Shoe Co. has consolidated its American Brakeblok and Sintermet Divs.

Eaton Manufacturing Co. has announced a $400,000 plant and equipment expansion for its Reliance Div. at Massillon, O.

* * *

General Tire & Rubber Co. has acquired a stock interest in A. M. Byers Co., and a proposed merger is under discussion. . . . Electric Storage Battery Co. has purchased all capital stock of Jessall Plastics, Inc.

* * *

Superior Tube Co. has begun construction of a large $500,000 plant and office building at Wapakoneta, O.

* * *

Warner Electric Brake & Clutch Co. will build a new plant for its Automotive Div. near Beloit, Wis.

* * *

Hamilton Standard Div. of United Aircraft Corp. has bought Aero-Pneumatics Div. of Pacific Airmotive Corp. . . . General Electric Co. has purchased nearly all of the assets of Watson Flagg Machine Co.

* * *

Kaman Aircraft Corp. has been awarded a contract by the Office of Naval Research to conduct research on an annular-wing or ring-wing type aircraft. . . . Douglas Aircraft Co. has been awarded a new Navy contract for an advanced version of the Skyraider plane.

* * *

The Air Force has placed a $248 million order with Boeing Airplane Co. for B-52 heavy jet bombers.

* * *

Union Carbide and Carbon Corp. has formed a new Silicones Div. to handle the development, manufacture, and sale of silicone products.

* * *

Du Pont Co. has announced a reduction of 25 cents per pound in the price of Mylar polyester film.

(Turn to page 100, please)

News of the AUTOMOTIVE

FIAT BUS PROVES PRACTICAL FOR CITY USE

The Fiat 411 urban bus will seat 22 passengers and can accommodate 66 standees. Powered by a six-cylinder engine with a maximum output of 140 bhp at 1800 rpm, it is 35 ft, nine in. long; eight ft, 1½ in. wide; and has a wheelbase of about 20 ft.

Transportation Needs Studied at Wash. Meeting

How to meet the necessity for maintaining transportation services and facilities adequate for the general economy and security of the nation at reasonable rates is a complex problem that merits close attention in the New Year of 1956. Taking this basic premise as their underlying theme, speakers from various fields at the U. S. Chamber of Commerce National Transportation Outlook Conference in Washington last month presented their individual views on ways in which various aspects of the question might be approached.

Leading off the morning panel of speakers, Dr. Paul W. McCracken of the Univ. of Michigan painted an optimistic picture of 1956 with expenditures by all forms of government and capital goods industries expected to continue a steady upward trend. Noting, however, such weak spots in the economy as declining farm income, slackening residential construction, decreasing orders for durable goods, and growing inventories, he urged serious consideration of both corporate and individual income tax cuts and an easing of Federal Reserve policy with regard to the money supply.

During the course of his succeeding talk, F. J. Iseman, Transportation Specialist of Merrill, Lynch, Pierce, Fenner and Beane, pointed out that, in spite of its tremendous growth in recent years, the trucking industry is still confronted by a plethora of cost, regulatory, tax, competitive, and financing problems that will be with it for some time to come. Mr. Iseman went on to comment on the phenomenal success scored by the air transport industry in 1955 with a gain of nearly 100 per cent in terms of revenue passenger miles forecast by 1965.

Louis S. Rothschild, Under Secretary of Commerce for Transportation, spoke on "The Administration's Program for National Transportation." In outlining the Government's general policy of better transportation at lower cost to the public, he mentioned particularly the imperative necessity of putting into effect an adequate and soundly financed highway program.

The next speaker on the agenda, J. Percy Priest, Chairman of the House Committee on Interstate and Foreign Commerce, stressed his belief that national transportation policy is in need of another periodic re-examination. In doing so, he directed attention to such important factors as the rapid past, present, and future growth of the country, the increasing demands made on each form of transportation, and the challenging question of providing increased opportunities for competition among common carriers, but at the same time protecting them from financial disaster.

Luncheon speaker Perry M. Shoemaker, Chairman of the Hoover Commission Committee on Transportation, reviewed the group's recommendations on cost savings which could be effected by the Dept. of Defense.

1955 RETAIL CAR SALES BY PRICE GROUPS*

Number of Cars

	November				Eleven Months			
	1955		1954		1955		1954	
Price Group	Units†	% of Total	Units†	% of Total	Units†	% of Total	Units†	% of Total
Under $2,000	90,176	17.89	226,834	59.92	3,281,732	50.14	2,919,634	59.68
$2,001 to $2,500	346,951	68 84	105,115	27.77	2,386,533	36.46	1,267,822	25.91
$2,501 to $3,500	45,083	8 94	37,834	9.99	687,429	10.50	516,979	10.57
Over $3,500	21,842	4.33	8,771	2.32	189,673	2.90	187,867	3.84
Total	504,052	100.00	378,554	100.00	6,545,367	100.00	4,892,302	100.00

Dollar Volume of Sales

	November				Eleven Months			
	1955		1954		1955		1954	
Price Group	Dollars	% of Total	Dollars	% of Total	Dollars	% of Total	Dollars	% of Total
Under $2,000	$174,078,960	15.07	$429,421,130	52.75	$6,230,503,652	43.16	$5,347,723,327	51.43
$2,001 to $2,500	758,834,153	65 69	244,000,719	29.97	5,488,331,464	38 03	2,908,777,640	27.98
$2,501 to $3,500	131,848,915	11.41	105,891,527	13.01	1,943,450,284	13.47	1,414,088,043	13.60
Over $3,500	90,405,035	7.83	34,792,360	4.27	770,339,907	5.34	726,889,274	6.99
Total	$1,155,167,063	100.00	$814,105,736	100.00	$14,432,625,306	100.00	$10,397,478,284	100.00

*—Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four door sedan or equivalent model. Does not include transportation charges or extra equipment.
†—New registrations of American made cars only. Does not include imported foreign cars.

AND AVIATION INDUSTRIES

AC Automotive Product Sales Shattered All Records in '55

AC Spark Plug Div. of General Motors Corp. has reported that sales of its automotive products in 1955 broke all previous marks and were 41 per cent above those for the previous year. Total divisional sales, including defense products, were 10 per cent above those for 1954. Defense sales in 1955 were down about 30 per cent compared with 1954.

Sales of original equipment to the automotive industries were up 52 per cent over 1954. In the replacement field a sales gain of 27 per cent was recorded.

Special Manifold Offered On Dodge D-500 Model Line

Dodge has disclosed that a new, dual-runner, twin four-barrel intake manifold is now available as an alternate manifold on the Dodge D-500 engine.

The carburetors have a large 1-1/16 in. venturi, and are interconnected with a conventional mechanical type linkage. Air cleaners are of the low restriction type.

The compression ratio of all D-500 engines is 9.25 to 1. Displacement is 315 cu in.

Volkswagen Drops Its Plans For Car Manufacture in U.S.

Plans for the manufacture of Volkswagen automobiles in the U. S. have been cancelled. According to Dr. Heinz Nordhoff, director general of the German concern, further investigations have raised serious doubts as to the company's ability to produce cars in this country at a profit, due to such factors as high labor costs. Last fall it was thought that U. S. assembly operations would be feasible (see AI, Sept. 1, 1955, p. 65 and Oct. 15, 1955, p. 192).

Volkswagen will continue to broaden and improve its dealer and service organization here. No arrangements have been made as yet regarding disposition of the $4 million former Studebaker jet engine parts plant at New Brunswick, N. J., which Volkswagen had purchased for its U. S. operations.

FRUEHAUF VOLUME VAN OF RUGGED CONSTRUCTION

This new Fruehauf volume van is available in both full-van and open-top models. Built of high tensile corrugated steel with a tensile strength of 70,000 psi, the entire van forms a one-piece box structure. Plastic skylight located in the center of the roof is riveted and sealed to make it weatherproof. Floor support is high tensile steel with deep eight-in. lipped cross members on 18-in. centers.

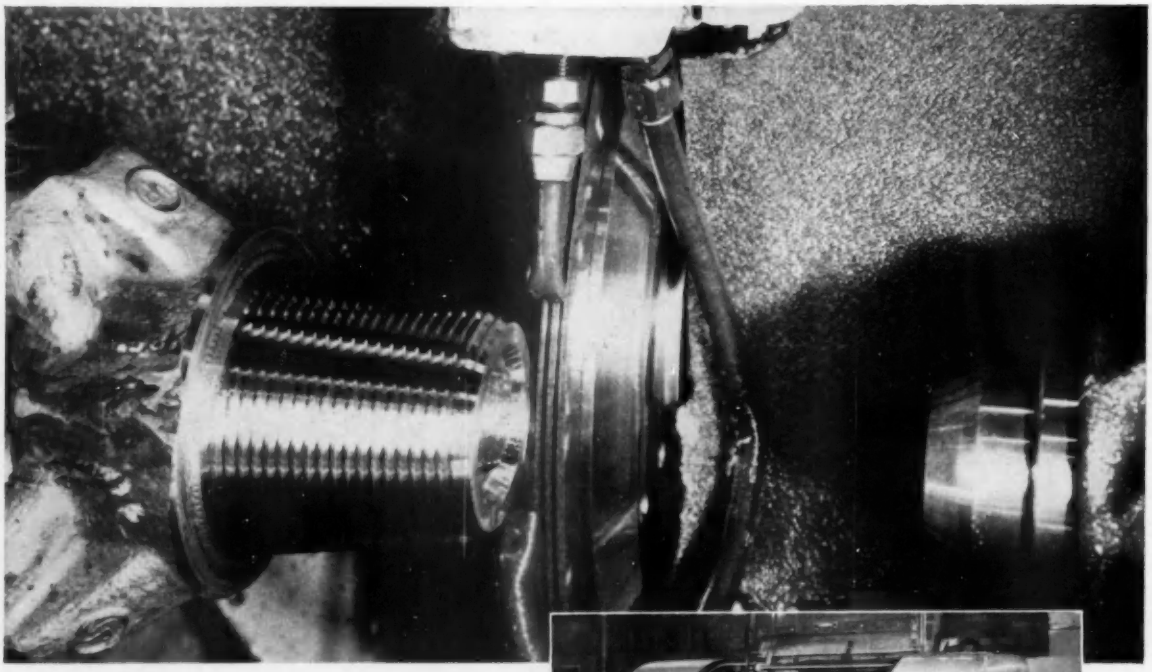
DECLINE IN NOVEMBER OFFSET BY PROGRESS IN YEAR

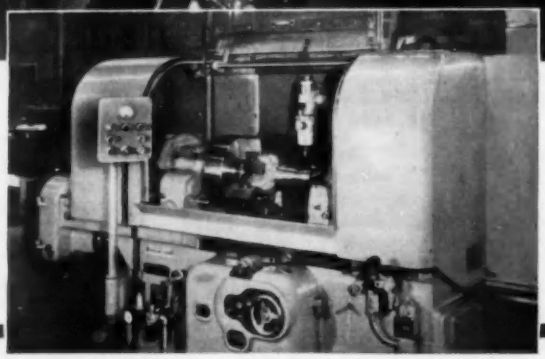
1955 New Truck Registrations*

Arranged by Makes in Descending Order According to the 1955 Eleven Months' Totals

MAKE	November 1955	October 1955	November 1954	ELEVEN MONTHS Units 1955	Units 1954	Per Cent of Total 1955	Per Cent of Total 1954
Chevrolet	28,577	33,430	23,791	295,090	270,660	34 17	35 82
Ford	21,183	23,673	17,831	267,520	245,753	30 99	32.24
International	9,683	8,185	7,200	92,860	77,376	10 76	10.15
G. M. C.	7,786	8,609	5,294	75,004	61,807	8 69	8 11
Dodge	4,738	5,680	5,173	60,803	55,182	7.04	7.24
Willys Truck	1,567	1,569	1,473	15,022	8,684	1.74	1 14
White	1,154	1,476	920	13,073	10,565	1 51	1.39
Studebaker	653	813	856	10,016	9,249	1.16	1.21
Mack	992	1,078	534	9,831	8,591	1.14	.73
Willys Jeep	955	1,059	695	9,229	6,874	1.07	.90
Diamond T	297	376	219	3,353	2,433	.39	.32
Divco	263	298	204	3,066	2,246	.35	.29
Reo	282	345	175	2,835	2,124	.33	.28
Kenworth	158	170	80	1,135	652	.13	.09
Brockway	128	106	122	1,010	1,232	.12	.16
Peterbilt	32	47	41	410	322	.05	.04
F. W. D.	33	24	29	282	360	.03	.05
Federal	5	2	6	40	239		.03
Misc. Domestic	77	89	39	854	483	.10	.06
Foreign	213	233	63	1,865	380	.22	.05
Total—All Makes	75,756	87,262	64,735	863,268	782,216	100.00	100.00

* Based on data from R. L. Polk & Co.





JOB DATA

Machine: Jones & Lamson Thread Grinder
Part: Rock Bit
Thread: 4½ API, 5 threads per inch
Steel: 4620
Wheel: Multi-rib Diamond Dress—24" dia. (new)
Speed: 1910 rpm (max.)

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Men in the News

Match & Merryweather Machinery Co. —Donald M. Pattison has been elected vice-president.

Pontiac Motor Div., General Motors Corp.—**Frank V. Bridge** is now general sales manager.

American Bosch Arma Corp. — **Lionel R. Fiedler** has been appointed vice-president.

Moraine Products Div., General Motors Corp. — **Elton S. Moyer** has been made chief engineer in charge of research and development, and **Francis J. Markey** has been promoted to sales manager of automotive products.

Eaton Manufacturing Co., Saginaw Div. — **Martin D. Archangeli** was named assistant general manager; **J. S. Kerr**, sales manager; **John O. Harvey**, plant manager; and **Melvin L. Zuehlke**, general superintendent.

New Process Gear Corp.—**David H. Brown** has been promoted to vice-president in charge of operations.

Dodge Div., Chrysler Corp.—**Fred M. Glassford** is now manufacturing manager, and **George H. Stover** succeeds him as works manager. **Elmer W. Engle** was promoted to director of planning.

Federal Motor Truck Div., Napco Industries, Inc.—**Michel R. d'Etampes** has been appointed export director.

Kearfott Co., Inc. — **Donald W. Smith** has been elected president; **Wladimir A. Reichel**, vice-chairman of the executive committee; and **Frederick D. Herbert, Jr.**, financial vice-president.

Square D Co.—**John D. Leitch** has been named vice-president of engineering, and **Alvin C. Dyer** has been made vice-president and general manager of the Electric Controller and Manufacturing Co. Div.

Tyson Bearing Corp.—**A. Stewart Murray** was elected president.

Eaton Manufacturing Co., Stamping Div.—**Robert J. Rooke** has been promoted to production control manager.

Eaton Manufacturing Co. — Paul W. Olson has been appointed general manager of the Foundry Div., and Robert C. Ochs has been named general manager of the Axle Div. in recent company changes.

Four Wheel Drive Auto Co.—**Howard R. Canada** has been named director of parts and service.

General Precision Equipment Corp. —**Barry J. Hawkins** has been appointed advertising manager.

L. Sonneborn Sons, Inc., Amalie Div. —**Chester H. Remmel** is now sales manager.

Dreis & Krump Manufacturing Co.—A. J. DeWolf was elected president and treasurer

American Motors Corp. — **Roy D. Chapin, Jr.**, has been elected vice-president and treasurer.

Solar Aircraft Co.—**Frederick A. Schneller** is now purchasing agent.

SKF Industries, Inc. — **John R. Bremer** was named purchasing agent.

Johnson Sheet Metal Works Corp.— **Geo. H. Hall** is now president; **E. H. Scott, Jr.**, vice-president and treasurer; and **Neil M. Logue**, production manager.

E. F. Houghton & Co., Metal Working Div.—**Sidney J. Barber** was named manager of the Metal Working Products Dept., and **Claude G. Wall** has become supervisor of Metal Working Research.

Victor Manufacturing & Gasket Co. —**O. W. Clifton** was named executive vice-president and **A. R. Smith** was made vice-president in charge of manufacturing.

Chrysler Corp., Engineering Div. — Paul C. Ackerman has been appointed director of engineering.

Acme Steel Products Div., Acme Steel Co.—**W. Sheridan Huss** has been appointed president.

Modine Manufacturing Co.—**Don F. Morse** has been named general manufacturing manager.

Clearing Machine Corp. — **J. R. Mann** was made controller.

Firth-Loach Metals, Inc. — **M. A. Cancelliere** was elected chairman of the board, and **William J. Loach** was named executive vice-president.

(*Turn to page* 100, *please*)

Necrology

Paul H. Kurz, president of Robert Bosch Corp., died Jan. 2 at New York, N. Y.

Harold S. Kendall, 62, assistant to the president of Dow Chemical Co., died Jan. 8, at Midland, Mich.

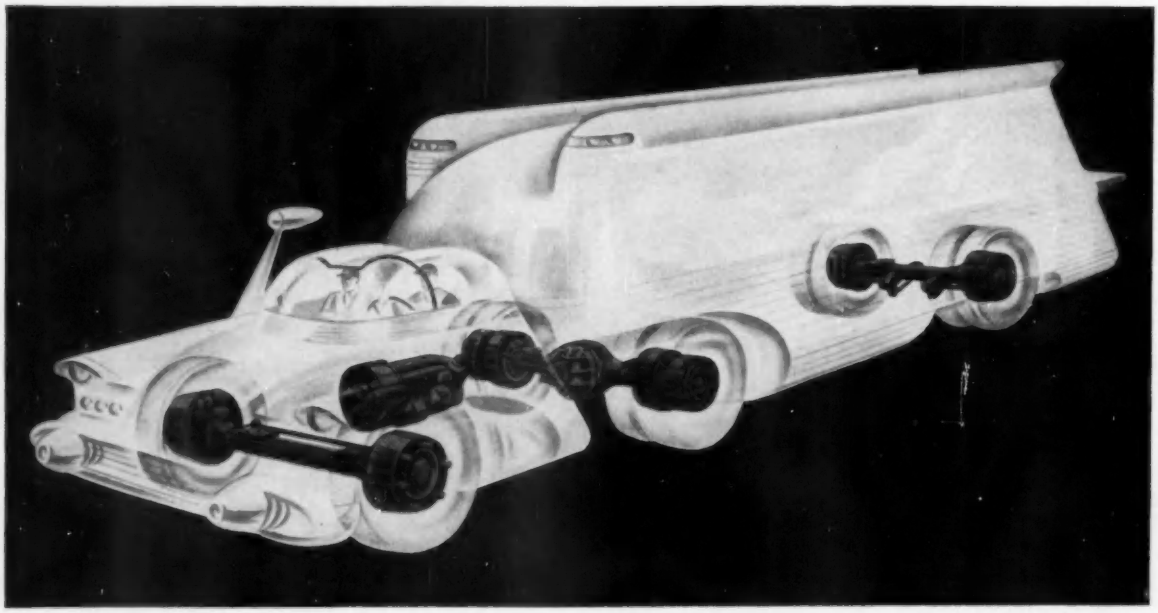
John A. Rellinger, 86, former superintendent of the Body Div. of the old Pierce Arrow Motor Car Co., died Jan. 8 at Buffalo, N. Y.

Henry M. Crane, 81, automotive pioneer and consulting engineer to General Motors Corp., died Jan. 21, at New York, N. Y.

Kells M. Cameron, 58, factory manager of the Chrysler Corp. of Canada passenger car plant at Windsor, Ont., died there recently.

Charles J. Hardy, former board chairman and president of American Car & Foundry Co., died Jan. 17, at New York, N. Y.

Carl G. Knarzer, assistant general traffic manager for U. S. Rubber Co., died Jan. 3, at Rutherford, N. J.



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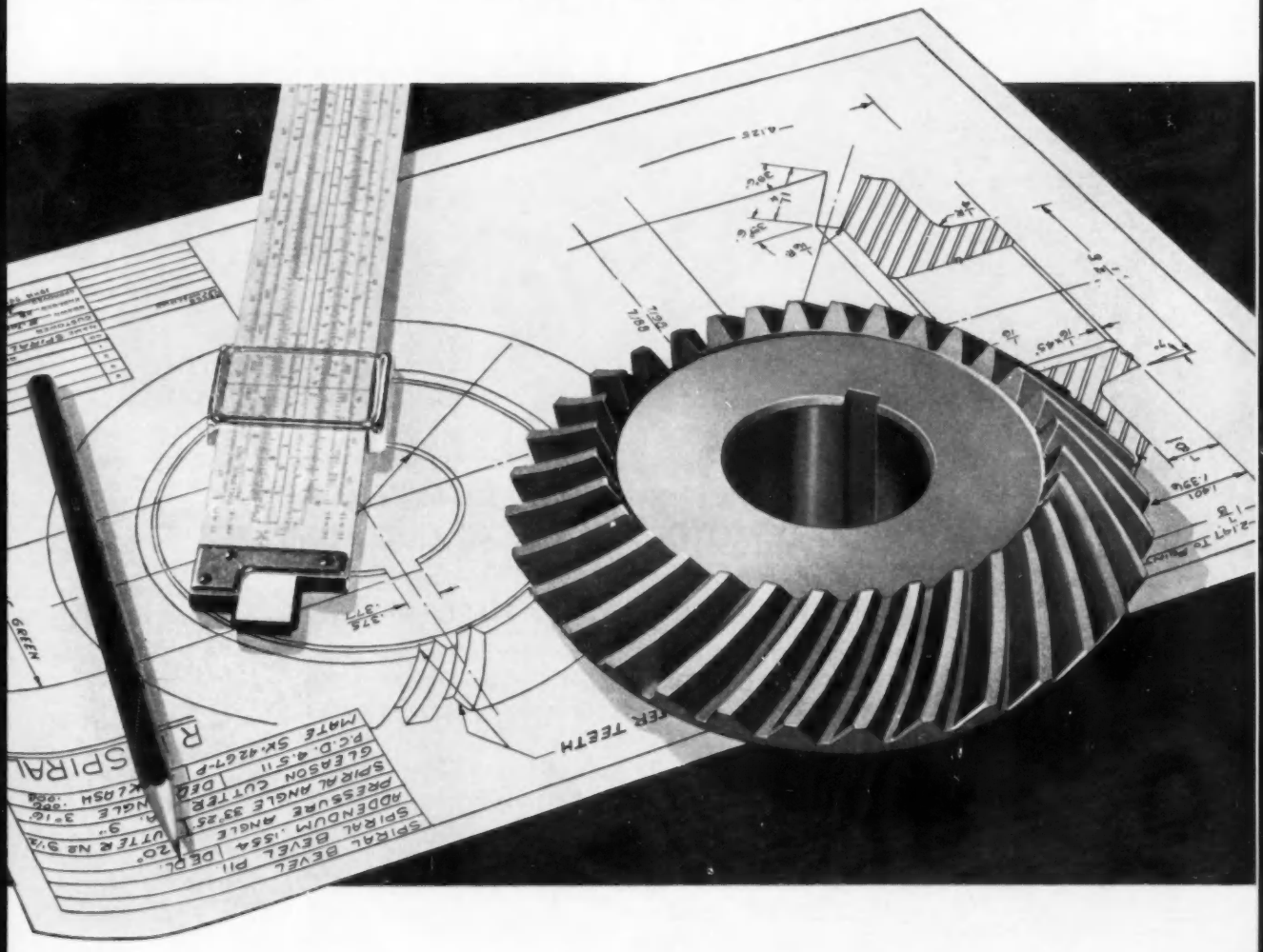

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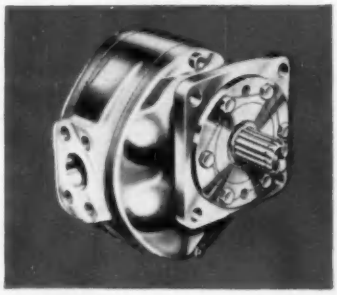
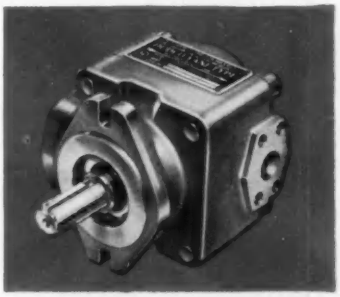
HYDRAULIC PUMPS

Famous Four-Bolt design, Gear-type Pumps for 1000 and 1500 psi operation in sizes delivering 3 to 110 gpm at 1200 rpm. Also available in Dual and Tandem units.



DUDCO
DUAL-VANE PUMPS

Fully balanced Dual-Vane Pumps for 2000 psi Continuous Operation in sizes 1½ to 120 gpm for heavy duty mobile and machine tool applications.

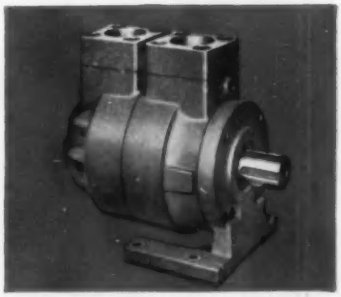


HYDRECO
FLUID MOTORS

Gear-type Motors in the famous HYDRECO Four-Bolt design featuring high running torques and operating at 1000 and 1500 psi. Flange or foot mounted models developing 0.1 to 60 hp.

DUDCO
FLUID MOTORS

Over 30 standard models for 2000 psi Continuous Operation, torque output from 180 to 14,400 lb.-in. Continuous Running Speeds to 3600 rpm.

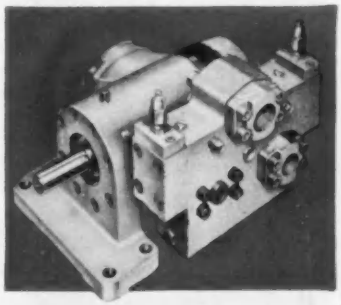


HYDRECO
HYDRAULIC VALVES

Hollow-Plunger Control Valves with 1 to 6 Plungers in capacities from 5 to 100 gpm for operating pressures of 1500 psi.

DUDCO
DOUBLE PUMPS

Equipped with Valve Panels. DUDCO Double Pumps provide simple and inexpensive Two-Pressure systems for Machine Tools and Hydraulic Presses.

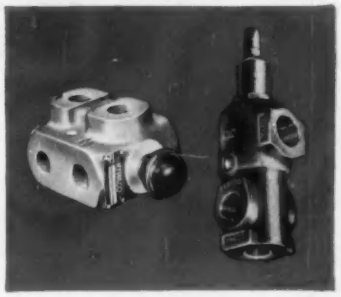


HYDRECO
HYDRAULIC CYLINDERS

Custom built Telescopic, Single-Acting and Double-Acting Cylinders designed to conform to special requirements for all types of mobile equipment.

HYDRECO
AUXILIARY VALVES

Adjustable Pressure Relief, Pilot Operated Checks and Selector Valves, as well as many Special Purpose Valves in capacities to 100 gpm and 2000 psi.



How Aluminum parts

For better parts at lower cost . . .

help Ford cut costs

THE Ford Motor Company recently changed its specifications on the Ford car windshield wiper knob insert to aluminum. This Ford part is one of several new screw machine parts now made from aluminum. They are currently studying other screw machine parts for possible conversion to aluminum.

This conversion met the requirements of management, design engineering and production groups.

Management requirement: Savings

Change to aluminum saved approximately 24.8%. Ford management is always interested in materials or methods that will effect savings with no sacrifice in quality. In this particular case, as in others, aluminum was selected because it provided savings of about 24.8% per piece, including scrap loss. Also, the aluminum parts are so much lighter than the previously used metal, that Ford has realized additional savings in shipping costs.

Designer requirement: Performance

Aluminum met design specifications. Ford engineers selected aluminum alloy 2011-T3, ⅜" round stock after they tested other metals and found that the aluminum knob insert would not only provide sufficient strength but would also take a slightly better knurl. The fact that aluminum satisfied performance requirements and for less money than other metals tested, was the main consideration in Ford's selection of aluminum.

Operator requirement: Machinability

Aluminum machined at maximum efficient cutting speed. The changeover to aluminum for this knob insert did not require any change in machining speed and setting from the previous metal used. Ford is running the part successfully at the maximum efficient speed of the automatic screw machine. And Ford found that it was not even necessary to change the angle of the form tool, which is an ordinary high speed steel tool with no chip-breaker.

The experience and engineering know-how of Ford has proved that properly designed aluminum parts can often provide substantial economies plus high quality.

You get these big advantages with aluminum

Each part costs less because you get *three times* as many parts from a pound of Kaiser Aluminum screw machine stock as you get from a pound of brass or steel. And these parts give you a unique combination of advantages, including lightness with strength, handsome finish, corrosion resistance, good heat and electrical conductivity.

Because of economy, plus these other advantages, we predict that hundreds of aluminum screw machine parts will soon become standard in American motor cars; for example, heater fan hubs, master brake cylinder pistons, door lock buttons, tire valves and spark plug terminals, compression fittings for gas and oil lines, hood release cable stops.

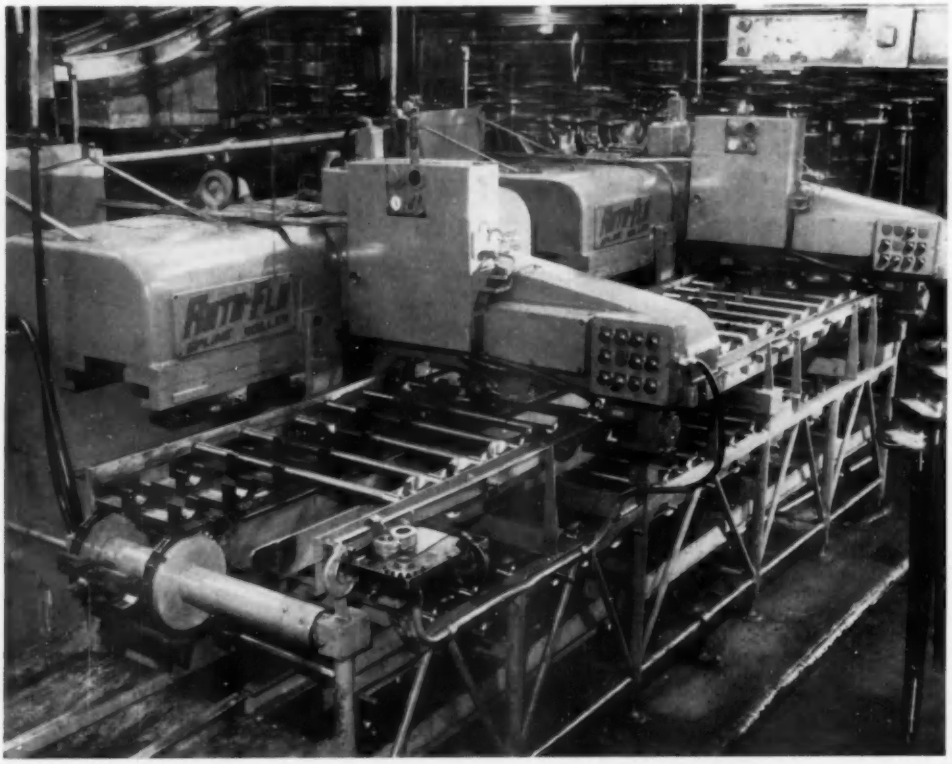
Our engineers will be glad to examine the screw machine parts now being used in your production to see how you can effect substantial savings by specifying them in Kaiser Aluminum.

Also, if you need assistance in finishing, welding, forging, roll-forming, extrusions, stampings, castings—or desire any type of engineering service and fabricating counsel—our development engineers will gladly provide it.

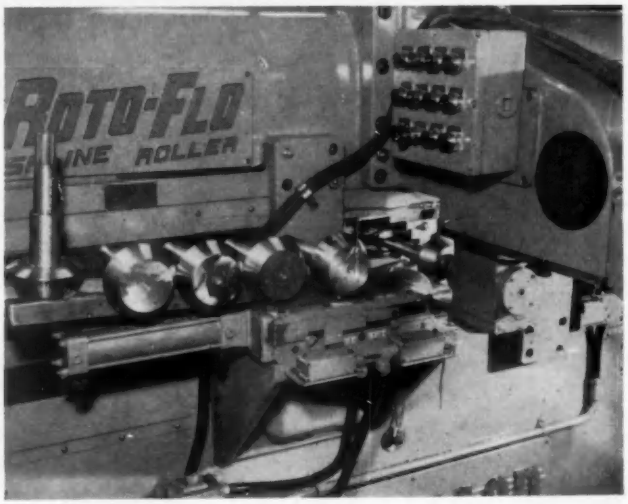
We may be able to suggest modifications in your designs, new fabrication techniques, changes in aluminum alloys—all of which may give you a better product at lower cost.

For immediate service, contact Kaiser Aluminum & Chemical Sales, Inc. *General Sales Office,* Palmolive Building, Chicago 11, Illinois. *Executive Office,* Kaiser Building, Oakland 12, California.

think of Kaiser Aluminum



All splines for the Buick drive line now are made by the Roto-Flo spline rolling method. This shows the group of two Michigan Roto-Flo machines connected by a transfer conveyor, producing the spline at the end in one machine—the other for the spline driving the oil pump.



Spline ends on short shafts such as the pinion shaft shown here — and the stub shaft for the propeller shaft—are produced in smaller Roto-Flo machines, fitted with an internal transfer conveyor

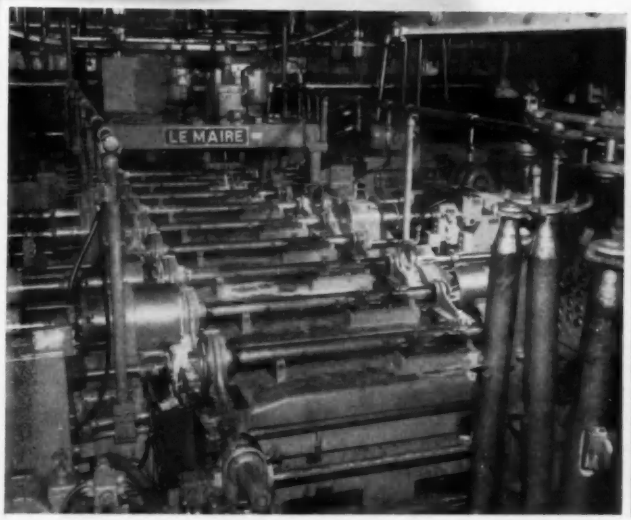
BUICK'S *New* Axle Department

for Completely Redesigned Units

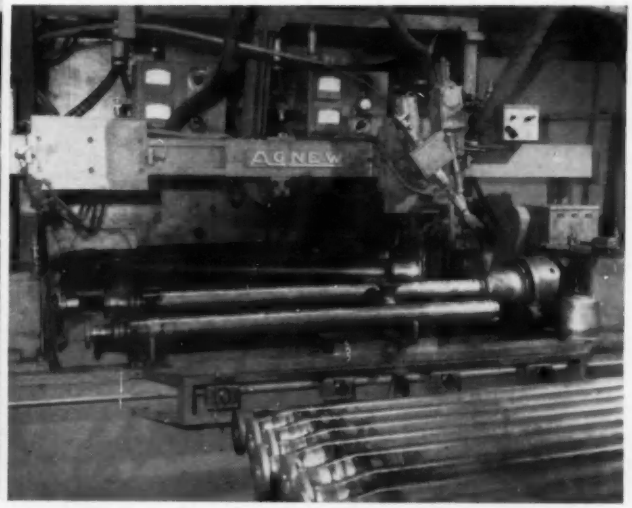
By
Joseph Geschelin

AMONG the major mechanical advances made by Buick for its 1956 models was a complete redesign of the rear axle and torque drive line. These changes, together with the greatly increased production demand, resulted in the equipping of an entirely new axle department, featuring not only machinery of advanced character but also the introduction of automatic material handling at every practical point.

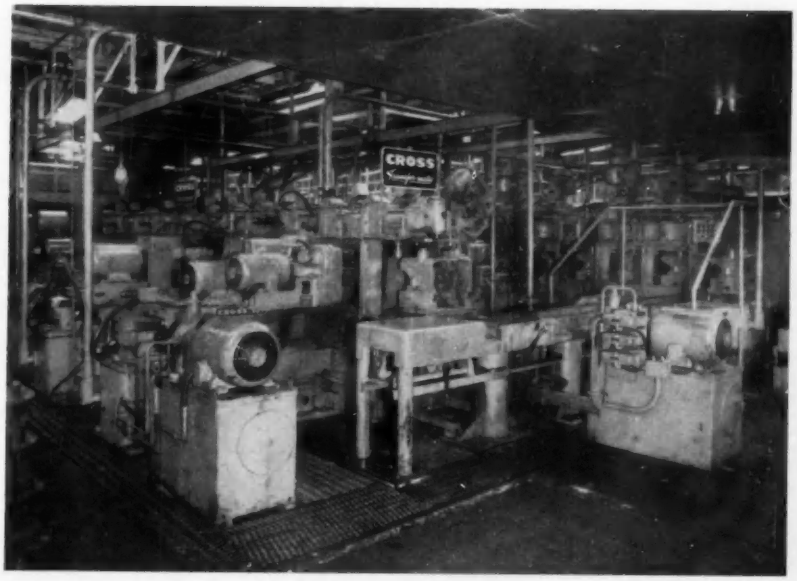
This article is concerned primarily with a sampling of unique operations to provide a visualization of the general nature of this plant rather than a complete summary of operations. It is worth noting at the outset that all external splines now are produced exclusively by rolling in Michigan Tool Model 1525 machines, providing a chipless technique which eliminates the former methods of spline cutting at Buick. This method is employed on axle shafts, propeller shaft stub end, and rear axle drive pinion. The operation is fast, automatic, chipless, and is performed



This is a perspective of the 10-station Le Maire transfer machine that handles machining at both ends of the torque tube.



One of the many items of Agnew welding machines found in the axle department. This does submerged arc-welding of the large flange end, at the right, to the torque tube.



Perspective of the large 32-station Cross Transfer-matic machine that handles most of the machining on differential carriers.

with exceptional control of both tooth form and size.

Since the sections of rear axle housing and many other parts are produced on presses, one of the features of the operation is an extensive press shop equipped with large presses of most recent types and makes. The two sections of the rear axle housing are blanked in an enormous 1500-ton Clearing press with a long bed accommodating two blanking dies. The material used for this purpose is hot-rolled steel strip, 0.180 in. thick, 17-in. wide, supplied in large coils. Coils are mounted in one of the latest type Littell cradle reels and are fed to the dies by means of heavy duty Littell feeder and straightener rolls, the latter being attached to the loading end of the press bed.

The dies are staggered in the press bed so as to make most economical use of the strip, leaving only three narrow strips of scrap. These are cut off by means of a Littell scrap cutter at the exit end of the press bed.

As the blanks leave the Clearing press, they are delivered by conveyor to the large 1000-ton Verson All-Steel press for forming. This is a transfer type press having six stations, the first of these for loading. In the process, the blank is trimmed, edges rolled over on each side of the banjo section to provide a double thickness of metal, then each blank is formed into a sharp V-form to facilitate formation at the next operation in a 2000-ton Cleveland press for forming, coining edges and trim to length.

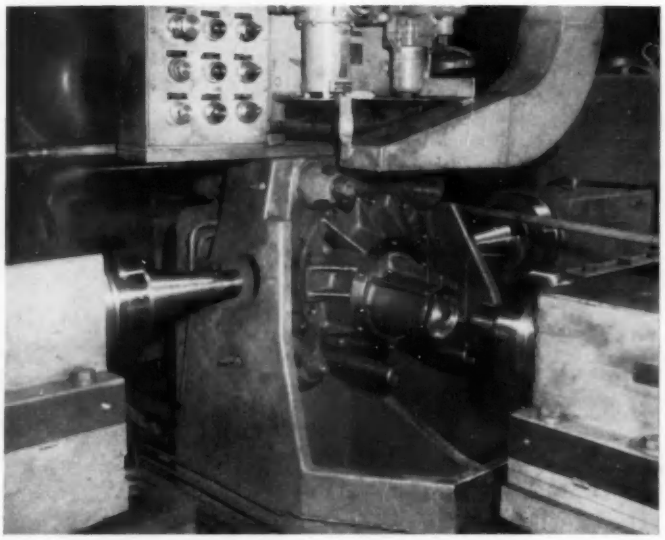
Another noteworthy heavy press operation is that of producing the rear axle housing flange, later seam-welded to the housing ends. Circular blanks for this purpose are blanked three at a time in a small Clearing press, delivered by conveyor to a 1200-ton Verson

All-Steel transfer press. It has six stations available, five working, one idle. Operation of the press is completely automatic, starting with an indexing table onto which the blanks are loaded in stacks. The entire feeding mechanism, including automatic pick-up of blanks by a vacuum-operated feeder, is part of the Verson equipment.

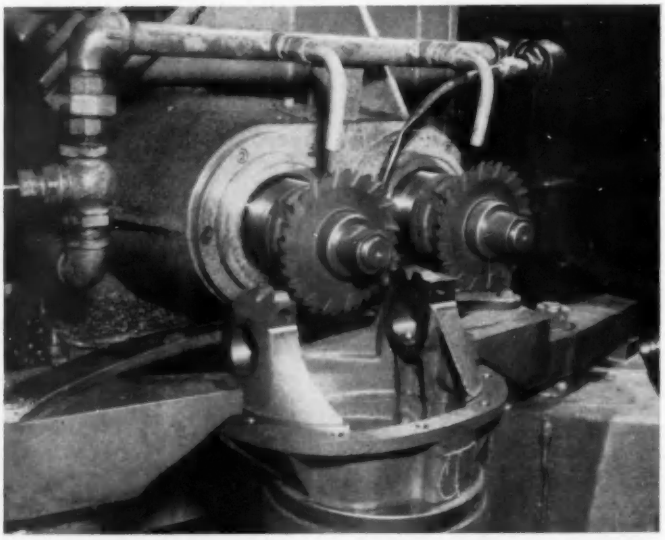
Since the final fabrication of the rear axle housing and torque tube assembly involves many seam-welding operations, the new plant is replete with numerous automatic and semi-automatic welding machines; equipped with automatic Lincolnweld and Linde submerged arc welding heads. An excellent example of this technique is found in the Expert welder for welding the rear axle cover to the housing, pointing up the fact that Buick has abandoned the former bolted-on construction. One feature of the operation is that the cover has an elliptical formation, requiring a special reciprocating motion of the Lincolnweld head to follow the contour.

Another typical example of seam-welding is that of attaching the large flange onto the torque tube. Here again is a special welding machine employing a Lincolnweld hidden arc head.

Illustrated here is one of the Michigan Tool Model 1525 spline rolling machines for axle shafts. Buick now makes axle shafts in two different types—a short shaft for the left side and a longer shaft for the right side. The right shaft has two separate splined sections; one for driving an internal oil pump on certain models. For splining the latter, Buick has installed two Michigan Tool machines in series, connected by automatic handling conveyors. The same type machine fitted with a smaller internal conveyor system, is used for splining stub shafts and pinion shafts.



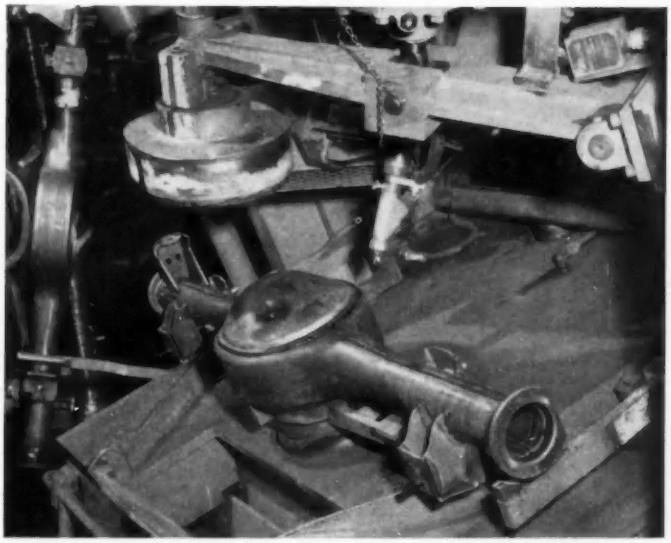
Close-up of work station of the four-way Ex-Cell-O precision-boring machine for finish-boring the main line and cross bores of differential carriers.



Close-up of one of the group of two special Snyder machines used for sawing two pinch bolt slots in the differential carrier.

In keeping with current trends, Buick has introduced a number of imposing transfer machines for some of the more complex machining jobs. An outstanding example of this is the 10-station LeMaire transfer machine on the torque tube line, illustrated here. It is impressive by virtue of the size of the work and the nature of the precision machining operations required at both ends. The sequence of operations is shown in the table immediately below:

STATION	OPERATION
1	Load
2 R & LH	Rough-bore large flange and chamfer Rough-bore small flange and chamfer Hollow-mill OD, break corner
3 R & LH	Finish-bore large flange, finish-bore small flange
4	Idle
5 R & LH	Rough-face large face and back chamfer Rough-face small flange and chamfer OD
6 R & LH	Finish-face large and small flange
7	Idle
8 R & LH	Drill both ends—8-spindle head for small flange, 12-spindle head for large flange Drill one hole in strut rod bracket
9 R & LH	Burr flange holes both ends, ream strut rod hole
10	Unload



A special submerged-arc welding machine, with an automatic indexing arrangement for the work to permit welding of the elliptical-shaped cover to the housing.

Differential carrier machining is much more complex, and requires preliminary boring and facing operations in a large battery of Bullard Mult-Aut-Matics, provided with special heads for producing the elliptical flange formation. Most of the other operations are handled in a battery of two, 32 station Cross Transfer-matic machines. They have the familiar pallet type conveyors, carrying individual fixtures into which the carriers are clamped. The sequence of operations is much too extensive to cover in this summary. Generally speaking, it includes a variety of milling, facing, turning, countersinking, tapping, and rough- and semi-finish boring operations.

As illustrated, the Cross Transfer-matic is made in two parallel lines, circumscribed by the closed conveyor system. Station 1 is for loading, station 4 is idle; tap drilling is done at station 9, these holes being probe inspected at station 10; station 18 is idle. Most of the stations have horizontal heads on the right and left hand side. Stations 16 and 17 have a horizontal head and a vertical head; while station 19 has three heads—R and LH for rough-boring the cross bores in both sides, and a vertical head for drilling. Similarly, station 20 has a R and LH head for semi-finish-boring the cross bore on both sides, and a vertical head for drilling. Station 21 is idle.

Station 22 has a RH head for probing inspection of two holes to be tapped later and a vertical head for drilling one long hole. Station 23 has a RH head for tapping the two holes and a vertical head for drilling the long hole to depth.

At station 24 the fixture is indexed 90 deg to present the work in this aspect to the remaining stations. Station 25 has R and LH heads or rough-boring, facing, and chamfering of the pinion bore small end; and for rough-boring the pinion bore at the large end. The small and large pinion bores then are semi-finish-bored at the R and LH heads at station 26. Station 27 is idle.

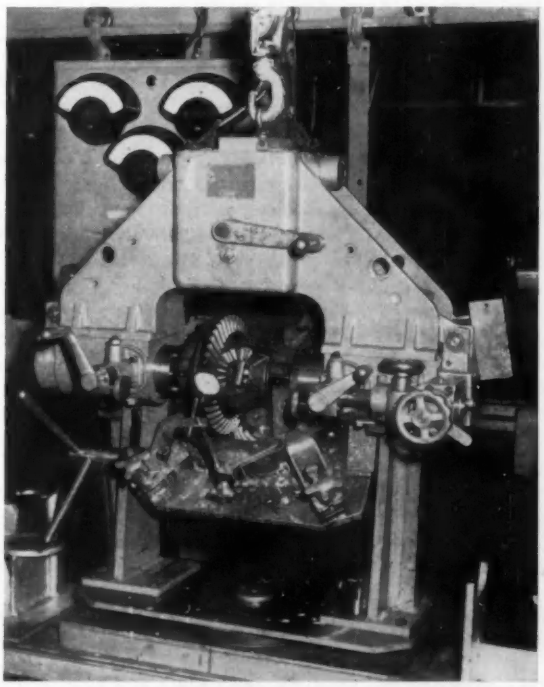
The part is unloaded at station 28 and the conveyor then moves along with the empty fixture to station 29 where the fixture is indexed 180 deg, washed at station 30, dried at station 31, and ends at station 32 which is idle and ready to load at station 1 for machining another part.

When carriers leave the Cross machine, they are transported by conveyor to a group of two massive Snyder special milling machines for milling two slots in the pedestals for pinch bolts. As illustrated, the machine has two milling spindles and is arranged for automatic operation. When the work reaches the milling position on the two-station index table, the head moves forward to complete the cut, then returns to idle position.

One of the major operations on the carrier is the precision boring of all cross bores in one of the familiar Ex-Cell-O four-way precision-boring machines.

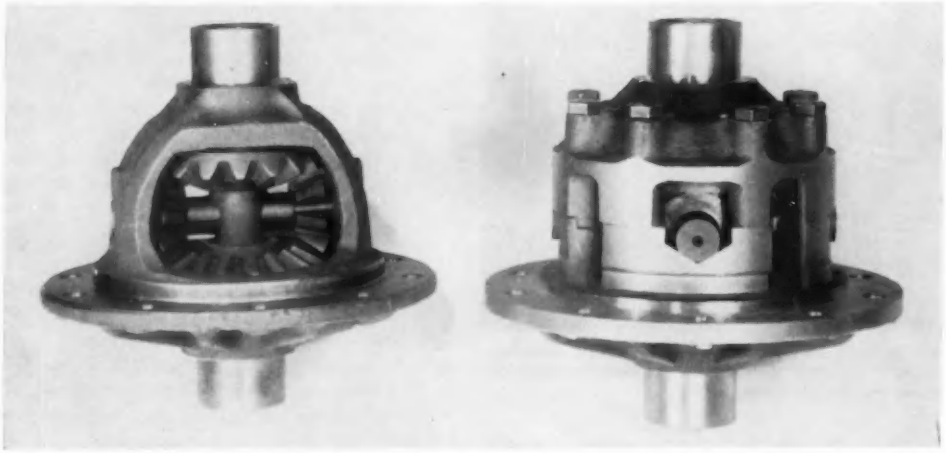
Assembly of the carrier with the differential and pinion has been developed in special fashion, and

(*Turn to page* 112, *please*)

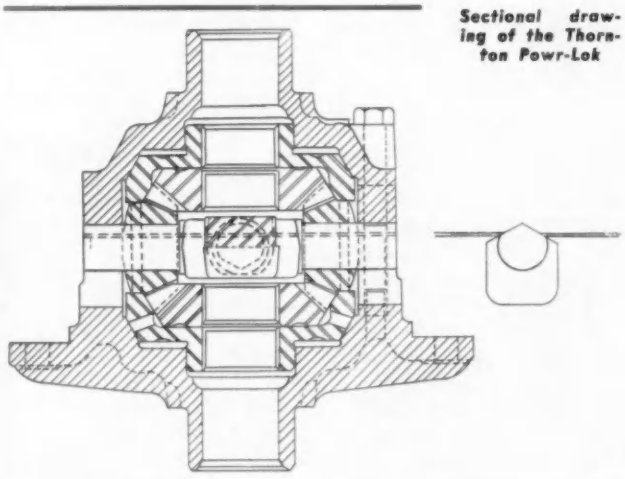


On the carrier assembly line—close-up of one of the special A. E. Parker & Sons electrical linear displacement fixtures for measuring the gap on each side of the differential for selection of back-lash and preload spacers, eliminating the use of manually-operated feeler gages.

Thornton Powr-Lok Differential



This is a view of the assembly of the Powr-Lok differential. The one at the left is the standard Spicer differential. Note the cam ramps machined in the Powr-Lok case at the right.



Sectional drawing of the Thornton Powr-Lok

WITH the introduction of its 1956 cars, Studebaker-Packard Corp. became the first motor car manufacturer to adopt a locking type differential. It is offered this year as standard on the Packard Caribbean, optional at extra cost on other Packard models.

This unique differential, known as the Thornton Powr-Lok, is produced by the Dana Corp. in its Fort Wayne, Ind., plant. It is of general interest that the device also will be offered for installation in light trucks and station wagons and is interchangeable as an assembly with present Spicer differentials.

In addition to unique design (patent pending) as evident from the illustration, Powr-Lok is distinctive in that it is not of full locking type. Spicer has found it undesirable to permit sudden transfer of full engine torque to one axle shaft since that imposes severe shock loading leading to failure. Consequently, it is designed as a torque divider, providing sufficient traction torque to the non-spinning wheel and always a certain percentage of torque transfer to the wheel with poor traction. The relative torque transfer depends entirely upon operating conditions.

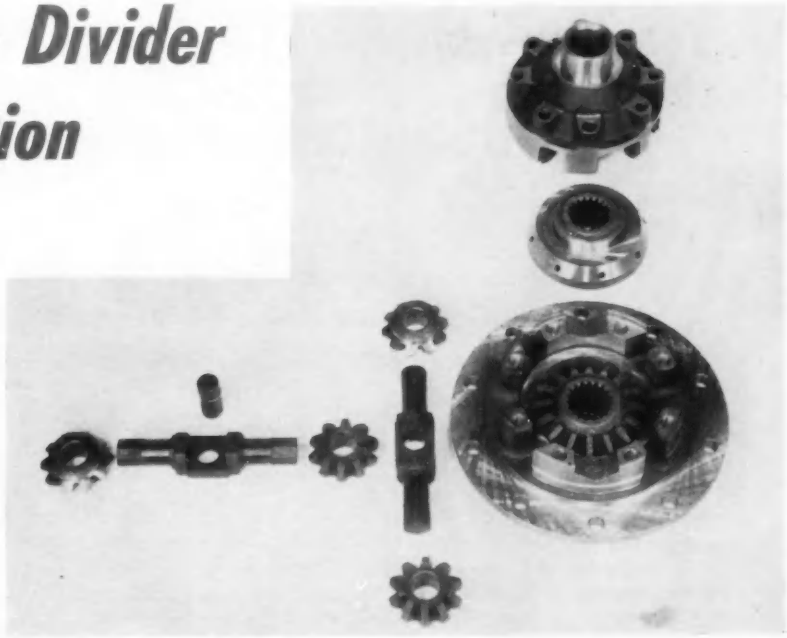
In the final design, shown here, load capacity is increased over the conventional differential since the load is distributed both over the gear teeth and cone clutches. Moreover, the action is the same for both drive, and coast, whether in forward or reverse.

Powr-Lok design has many interesting features. First of all, the conventional cross mounting of pinions is replaced by two individual cross pins with a slidable joint at the center, permitting each one to move independently although continously engaged. Ends of the pins are machined in the form of a Vee, the angle of Vee being determined for each application. A similar Vee is then machined in the case, as shown, to provide a ramped cam surface.

Clutch rings are fitted over each of the side gears, mating with the cone surface machined at each end of the halves of the differential case.

In the general scheme of operation, say in forward

Has Torque Divider Action



Exploded view of Powr-Lok components. Design of the cross pins and the machined ramps in the case are shown in the illustration.

driving with full traction on both wheels, both cross pins move up on the ramp of the cam — a very slight amount dimensionally—to lock both clutch rings. When cornering, on the other hand, the pinion mates for the inner wheel are caused to rotate and since they are restricted by the fixed gear, they cause the cross pins to move down the ramps, thus relieving the thrust load on the cone clutches. This permits the outer wheel to turn faster as in a conventional differential.

A similar sequence of events occurs instantaneously when there is a marked difference in traction requirements between the driving wheels due to snow or slippery pavement or on rough roads. In each instance there is movement of a cross pin along the ramp to relieve pressure on the cone clutch on the side where less torque must be transmitted. By this means the wheel with traction gets a greater percentage of wheel torque, although the wheel with poorer traction always receives as much torque as it can handle under the circumstances.

This brings to light one of the major advantages of the Spicer differential. Whenever there is slippage on one side, clutch pressure is relieved on that side and, consequently, there is no wear on the slipping members. By virtue of this, it is claimed that the mechanism is long lived and very reliable.

Generally speaking, the automatic functioning of the differential is said to provide vehicle safety and stability in high speed driving and cornering. In addition, it prevents wheel spinning and sudden shock loading due to wheel bounce over rough roads.

• • •

Ford Stock Stampede Yields $642 Million to Foundation

The expected stampede for Ford Motor Co. stock brought the Ford Foundation more than $642 million in the first day's trading, which saw the asking price of the shares jump to more than $70 a share. It was estimated that between 300,000 and 400,000 investors split the initial offering of 10.2 million shares.

Officially offered to the public on Jan. 18, the stock (priced at $64.50) was sold out within a matter of minutes in an over-the-counter scramble by both veteran and new investors. Many brokerage houses reported they could have sold more than 10 times the number of shares that they were alloted.

The Ford stock is not expected to go on the New York Stock Exchange for several days yet, probably about the middle of February. Hence, it is difficult to estimate the actual number of shares that have been traded. More than 700 firms participated in the underwriting.

Financial observers estimate that the stock will pay about 60 cents a share in the first quarter. They see a possibility of a year-end dividend that might bring the total yield to about $2.40 a year, or about 4.6 per cent, slightly higher than General Motors and Chrysler stock yields percentage-wise. GM has been paying about 4.5 per cent while Chrysler's yield from dividends has been amounting to about 3.7 per cent.

$1 Million Latex Operation To Be Built by Dow Chemical

Dow Chemical Co. has started construction of a $1 million plant for production of synthetic latex at Pittsburg, Calif., to serve the western market. Scheduled to begin production this fall, the plant will produce a wide range of styrene-butadiene latexes used in paints, coated papers and other products.

By Joseph Geschelin

Latest Developments in

Ford Automation Techniques

Automatic Handling and Machining Equipment of Most Efficient Types Employed in the Cleveland Engine Plant No. 2 Which Has Been Expanded for Six-Cylinder Engine Production

NEWEST of Ford Motor Co. engine plants, Cleveland Engine Plant No. 2 (see AI, December 1, 1955), represents the most advanced manufacturing methods developed by the company and contains the latest equipment obtainable from the combined skills and experience of machine tool builders, automation designers, and many factory layout experts.

When previewed late in November, 1955, this plant contained 562,000 sq ft of productive floor space devoted to the manufacture of Ford V-8 engines. Meanwhile the floor space was being expanded by some 300,000 sq ft to make way for production of six-cylinder engines which will be moved from Cleveland Engine Plant No. 1.

The new plant is a striking example of the latest developments in Ford automation techniques as well as in material handling methods of every description, designed to eliminate manual handling.

The control board seen here provides for the synchronization of the 14 conveyor lines in the J. B. Webb power-and-free system. The entire system, together with arrows indicating the course of flow, is shown on the vertical panel. The meters at the lower edge of the control panel are calibrating dials that make it possible to change the speed of the system as desired.

One of the noteworthy automation installations is a network of 14 independent power-and-free conveyor systems installed by Jervis B. Webb in the engine assembly area. This unique system, running some 8000 ft in length, has the various sections tied together into an automatically-controlled system by means of a single master control panel, illustrated here. It extends through four main areas—engine assembly line, engine "hot" testing, engine repairs —on "free" lines, and automatic banking of engines for shipping dock. "Free" lines are used in storage and bank areas, for engine repair areas, and in other places to provide for maximum flexibility of operation without interfering with the normal course of production flow.

This first installment is largely pictorial to show some of the details of J. B. Webb automation and other equipment. Succeeding studies will touch on some highlights of ad-

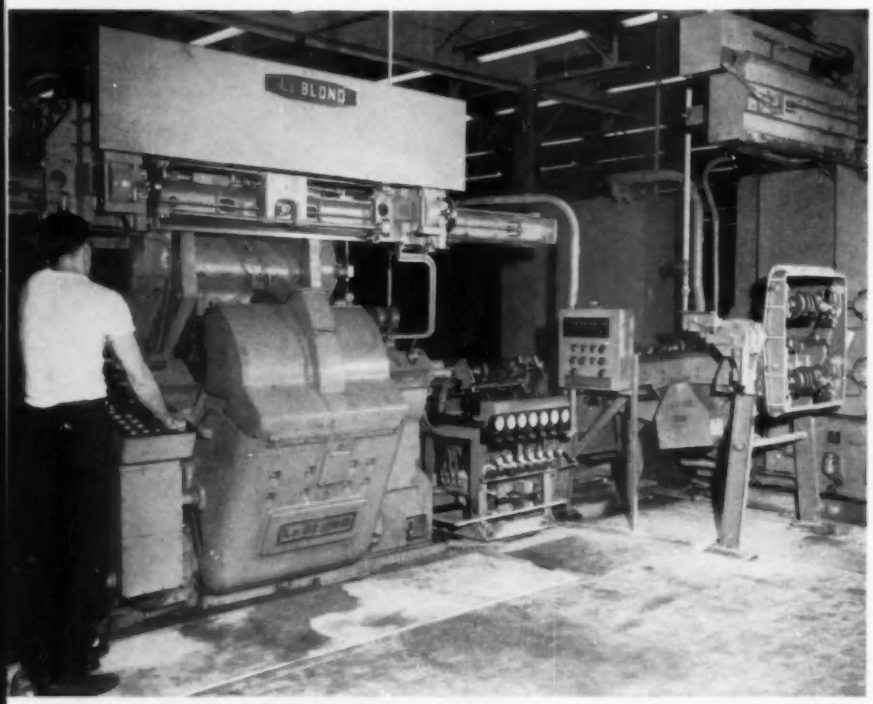
One phase of the Jarvis B. Webb power-and-free automatic conveyor system—passing through the final assembly stages. Note that the block is mounted on its carrier at a height convenient for the operation at each station. The carrier has a universal mounting permitting the engine to be turned freely in any desired position.

vanced transfer machine operations including the cylinder block, cylinder head, manifolds, etc.

As cylinder blocks come off the machine line they are transferred onto the first phase of engine assembly which is carried out on a mechanized conveyor line. The principal operation is to install the crankshaft and main bearing caps. At the end of this conveyor the cylinder block is removed and attached to the carrier on the automation conveyor system and remains on the same carrier throughout all of the subsequent operations of final assembly, hot test, repair (if necessary), and routing to banks ahead of shipping.

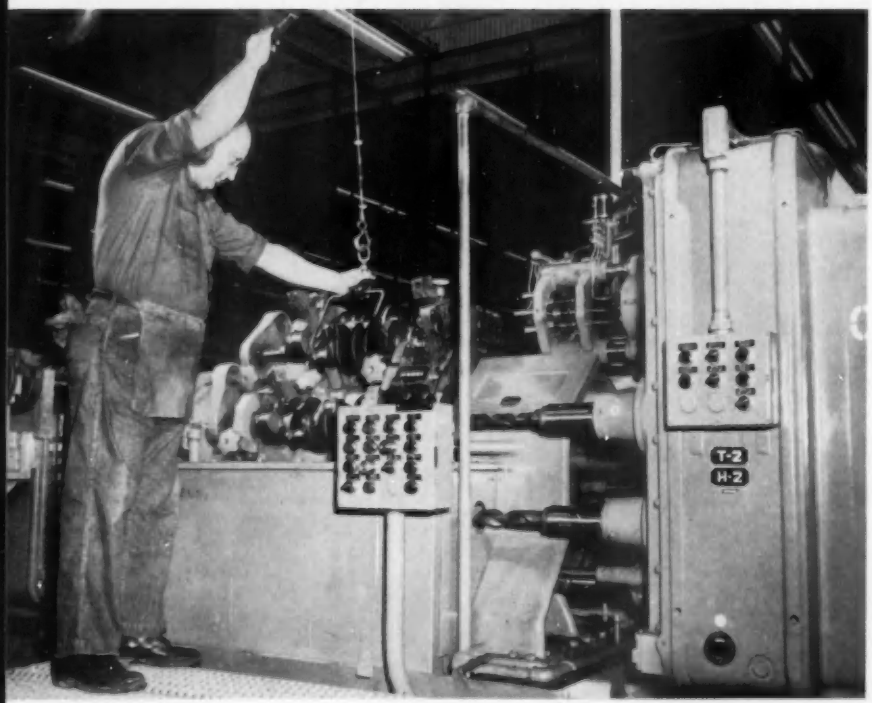
As the block is attached to the carrier an operator re-

View of one side of the "hot" test department. Engines come in from the assembly line on the power-and-free system down the center between the two banks of test stands. Then they are routed on the transfer lines to the stands. The transfer lines, seen overhead at right angle to the central conveyor, are "free" lines during the test procedure.



As described in the text, this new type LeBlond crankshaft lathe is employed for the turning of main bearing lines. Note the automation conveyor at the right as well as the automatically operated loading and unloading mechanism which is a part of the machine. The Sheffield gaging machine is used for sizing main bearings before leaving the line. At the extreme right in this view may be seen the method of automatically loading two crankshafts at a time into the LeBlond pin turning machine.

Close-up of trunnion type Natco drilling machine for variety of operations on flange end and opposite end of crankshaft.



cords on the adjacent TelAutograph station the code of bore sizes stamped on the block. This is communicated to the first station on the suspended conveyor assembly line where a suitable set of piston and connecting rod assemblies is picked from the storage rack and held for this specific block.

The automation system then transports the cylinder block through the many stages of engine assembly. Multiple-spindle air tools are used extensively along the assembly line, one of the noteworthy items being a large I-R multiple-nut runner taking nine fastenings at a time for each cylinder head. It is of interest that although these nut runners have torque control, all fastenings are hand torqued to assure conformity with specifications.

Near the end of the assembly line the conveyor system carries engines through Peters-Dalton spray booths for painting. Prior to entering the spray booths, the engines are fitted with various masking devices. Following paint the engines proceed to the final dress-up line, then continue to the hot test stands.

Engine testing is handled on a battery of 44 special automatic test stands where they are put through an established cycle of events for 20 minutes.

Quality control is one of the most important activities in this plant since maintaining close tolerances is very necessary in a mass production operation of this character. Sheffield Precisionaire gages and inspection machines are widely employed here, several examples being illustrated. One of these is the large gaging machine that gives simultaneous readings of some 64 dimensions on the crankshaft. Another shows a battery of Sheffield gages for the final inspection of cylinder heads. According to the management about 250 of such gages are found throughout the plant.

In addition to the use of Tel-Autograph communication for engine assembly, the units are

also used for the classification of crankshaft pin bearing diameters as well. They are graded on the Sheffield machine; the grades specify the sizes of bearing inserts selected for the big end of connecting rods.

Although transfer equipment will be treated more fully in the next installment, some notes on crankshaft production will be mentioned at this point. Illustrated here is one of a battery of advanced type LeBlond crankshaft lathes. This one does the rough and finish-turning of main bearings, oil seal diameter, pulley diameter, OD of flange hub, and sprocket diameter. In addition, the same setting faces both sides of the flange chamfer.

Attention is drawn to the installation of the special Sheffield gaging machine for inspecting main bearing diameters before the crankshaft is permitted to move to the next operation.

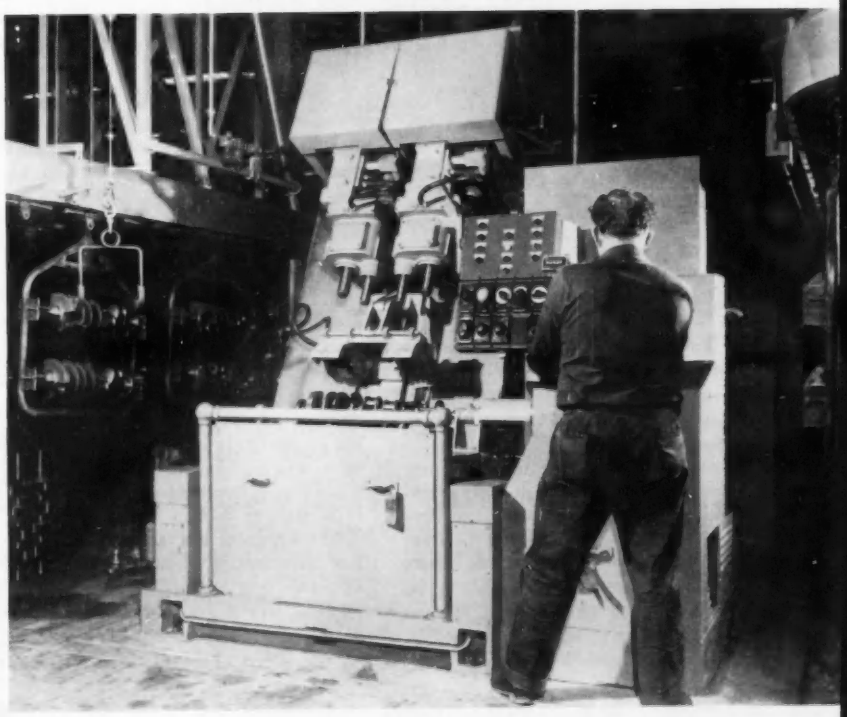
This illustration also features the automation equipment typical of current LeBlond installations. In the first place, work comes to the machine on an automation conveyor located at the side, picked up by the automatic loader which is actuated by a mechanism near the top of the machine. One crankshaft is picked up for loading while a finished crankshaft is unloaded into a gaging station at the right of the machine.

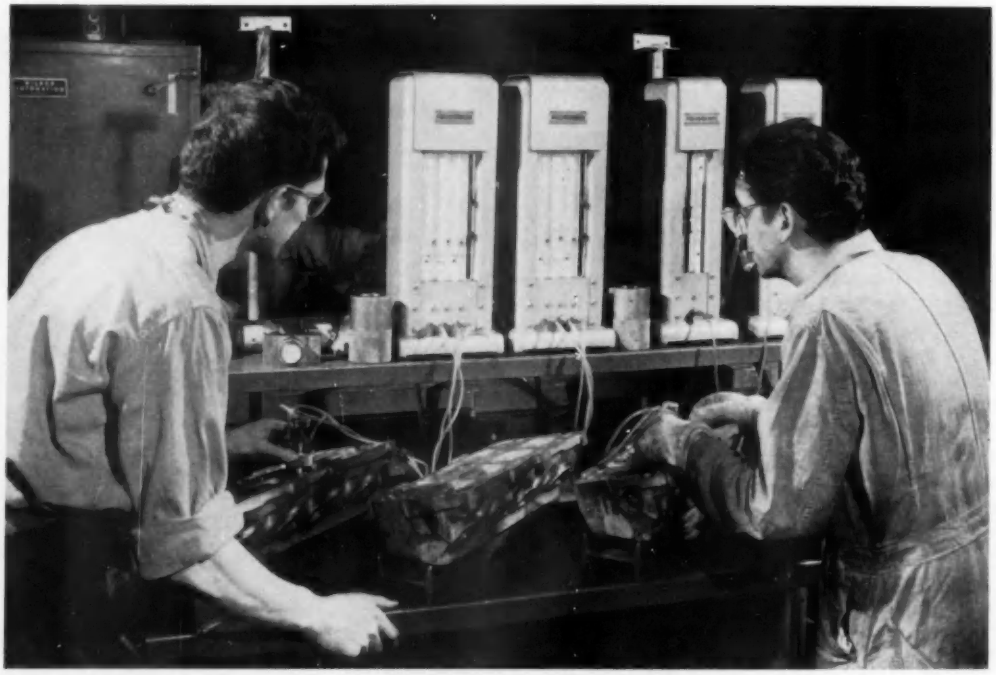
LeBlond PBA Duplex automatic lathes similarly are employed for the rough- and finish-turning of diameters and width of four pin bearings. In this case, the work is brought to the machine on automation conveyors and the automatic loading device picks up two shafts at a time, placing them in the machine chucks.

A special Kreuger-Barnes 45-station sensitive drilling transfer type machine handles the drilling of oil holes in the crankshaft. It drills eight oil holes from the main bearings to pin bearings; eight metering holes in pin bearings; and drills four large diameter lightening holes in the pins. (*Cont'd next page*)

Example of the many types of Sheffield gaging machines found in this plant is the one seen here. Installed at the end of the crankshaft department, it gives simultaneous readings at some 64 critical points.

This is one of the battery of five Tinius-Olsen semi-automatic electronic crankshaft balancing machines. They are installed within a loop of the conveyor system leading from the crankshaft department. Balancing is done at the station to right, balance-drilling at the left.





These Sheffield gages are found in the cylinder head department for checking the variety of bores, valve openings, etc.

A special Natco, two-way, nine-station trunnion type machine has been tooled for a variety of operations on both ends of crankshafts. These include: drilling, reaming, finish-reaming, hollow-milling, counterboring, tapping, recentering, and spot-facing to length. The flange end has six holes and a counterbored center; while the opposite end has one large diameter drilled and tapped hole.

Final operation on the crankshafts is balancing. This is done on a battery of five Tinius-Olsen electronic balancing machines, holding tolerance to plus or minus 0.15 oz in. As illustrated, the crankshaft is automatically balanced at the station on the right, then transferred to the automatic drilling station at the left.

Another article devoted to Ford's Cleveland Engine Plant No. 2 will appear in an early issue of AUTOMOTIVE INDUSTRIES.

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Longer-Lasting Paints Developed By Du Pont

New Lucite acrylic paints now are starting to appear on passenger cars. Pontiac is using the new paint on its Star Chief Custom Catalina coupes and Catalina sedans.

It will probably take some time yet, however, before such paints become readily available on all cars. At the moment, the paints are very expensive and in short supply because of limited manufacturing facilities.

Developed by Du Pont, the new lacquers are said to retain their original luster much longer than the previous types, but reports that vehicles will need no polishing during their life are exaggerated. Another type of paint, which causes a surface to change shade with angle of inspection, also is under development by Du Pont. The multiple-color illusion is accomplished by adding a bronze powder to the paint.

Further Battle in Offing On Unemployment Payments

A new fight is shaping up on the supplemental unemployment payment plan, which could upset the entire program negotiated by automobile companies and the UAW last year. A move has been started in Michigan by a newly-organized group to prevent integration of the SUP plan with State benefits, scheduled to go into effect in June.

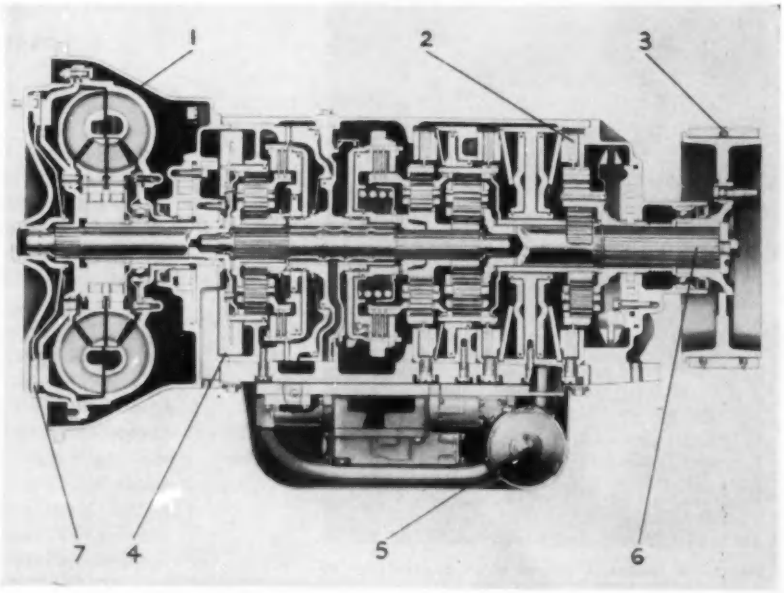
The organization, called the Michigan Information Committee, made up of some 100 businessmen and farm leaders, will press the State Legislature for a new law to block the plan. If the Legislature fails to act, the organization may seek a voter referendum.

The group's principal objection to the SUP plan is that it imposes an additional burden on small companies, which contend that they could not afford the additional expense, inasmuch as they already are contributing to the State Unemployment Compensation Fund. It also feels that the plan destroys the incentive of an unemployed person to seek new work.

Payment of private benefits concurrently with state payments to jobless persons is at present illegal in Ohio, where voters last year turned down the plan. However, in order to circumvent the Ohio law, the UAW has instituted a plan whereby a jobless person can collect SUP payments due him after he returns to work and ceases to collect his state benefits.

Six-Speed Automatic Transmission

Among Highlights of '56 Chevrolet Trucks



Features of the Powermatic unit, as shown in the cutaway, are (1) the torque converter, (2) reverse gear clutch, (3) parking brake, (4) a built-in safety device, the hydraulic retarder, which augments the brake system, (5) oil sump, (6) transmission output shaft, and (7) converter lock-up clutch

Dual-wheeled medium-duty stake truck of nominal two-ton rating in the 6000 Series

An exclusive six-speed automatic transmission, the Powermatic, leads the list of developments for Chevrolet's more powerul 1956 truck line. These latest "Task Force Trucks" are designed to meet virtually every specialized truck requirement, according to Chevrolet. The new line of 75 models, available on 15 different wheelbases, features automatic transmissions for all models except school buses.

The Powermatic six-speed unit is offered on 15 models in the two-ton group. Effective at all driving ranges, the unit determines a shift schedule according to load, speed, grade and other factors. The unit may also be shifted by the driver into three specialized ranges. These are drive; intermediate, for mountainous country; and low, for controlled power.

Powermatic embodies a torque converter in series with a six-speed hydraulically controlled transmission. Maximum torque multiplication in the drive range is 7.5 times that of the engine, while in low range torque is as much as 14.8 times that of the engine. A direct drive clutch is incorporated in the unit. The new transmission utilizes a hydraulic retarder which augments the brake system. This retarder is located in series with the gear train and is operated by a pedal occupying the conventional clutch pedal position. When the pedal is depressed, oil floods a chamber of the transmission in which blades are rotating. As more oil pours into the chamber, offering more resistance, the blade rotation slows down, thereby slowing the drive shaft.

Augmenting engine braking up to six times the braking force of the engine alone, the retarder is said to provide greater downhill control with little or no

(*Turn to page* 111, *please*)

SAE Annual Meeting

Latest Automotive Developments

George A. Delaney, newly elected president of SAE

HEIGHTENED enthusiasm and interest, with a background of entry into the second half of a century of technological advancement, was the keynote of the 1956 annual meeting of the Society of Automotive Engineers held in Detroit during the second week of January. Some 6000 engineers, executives and technicians were in attendance to gain and dispense knowledge, compare notes and advance engineering development sparked by the presentation of 62 papers, panel discussions, and committee meetings. The program was so comprehensive that the 24 technical sessions were scheduled at both the Sheraton-Cadillac and Statler hotels, and the 64 technical committee meetings at the two hotels and the Rackham Memorial building.

George A. Delaney, the newly-elected 1956 president of the SAE, was introduced to the gathering at the annual dinner held in Detroit Masonic Temple. He is chief engineer of Pontiac Motor Div., General Motors Corp. All of the 1956 electees to office are listed in another portion of this article.

Wilber M. Brucker, Secretary of the Army, was the principal guest speaker at the banquet. Stating it is essential that we have an Army fully capable of dealing effectively with every threat to our security, and pointing to the global aspects, he stressed that the Army must have greater mobility than has ever been required in the past. He said that within this field are found some of the Army's most challenging problems applying to the further development of air transport equipment and a reduction of weight of all transported equipment to facilitate strategic and tactical movement of fighting units by air.

The SAE Horning Memorial Award for the best 1954 paper on fuels was presented this year to Bernard M. Sturgis, assistant director of the Du Pont Petroleum Laboratory, E. I. du Pont de Nemours and Co., Inc., at the business session of the Fuels and Lubricants Activity held January 12. The paper, "Some Concepts of Knock and Anti-Knock Action," was given August 18, 1954, at the SAE National West Coast Meeting.

The large engineering display this year, encompassing 72 exhibitors and 113 booths, was necessarily distributed among four sectons of the Sheraton-Cadillac hotel. A very wide variety of automotive and aircraft products were exhibited, ranging from materials, small parts, manufacturing processes, testing equipment and new components, to complete engines. Illustrative of the items shown, but by no means all-inclusive, are the following: Stewart-Warner Corp. announced and showed for the first time its new Alemite centralized lubrication system. Bendix Aviation Corp. displayed Cerametalix friction lining for heavy-duty clutches and disk type brakes, compounded of ceramic and metallic ingredients and made in the form of buttons. Vickers Inc. introduced a line of 5000-psi pumps and motors of variable and fixed displacement. Aeroquip Corp. showed its new Teflon hose with detachable and reusable fittings, and its series 510017 Freon self-sealing couplings. Waldes-Kohinoor, Inc., had a multiple dispenser for mass application of Tru-arc retaining rings of the E and crescent types. Lord Manufacturing Co. announced its Dynaflex joints for pivot applications in commercial vehicles. The Leece-Neville Co. showed a compact rectangular motor for such installations as power seats and window lifts.

Monroe Auto Equipment Co. demonstrated its new rack and pinion direct-action power steering. Performance Measurements Co. introduced a servo digital millivolt indicator of the null balance type having a direct reading scale with a readability of one part in a thousand. Jervis B. Webb Co. had on demonstration an automatic hydraulic valve body test stand for power steering gear valves. Waukesha Motor Co. featured fuel rating laboratory engines in its exhibit. Continental Motors Corp. displayed a new horizontally-opposed, supercharged, aircooled aircraft engine,

By
Charles A. Weinert

Discussed As

SOCIETY OF AUTOMOTIVE ENGINEERS

Enters Its 51st Year

Model GSO-526, of 526 cu in. displacement and rated 400 bhp at 3200 rpm. Also the Continental VD-8603 Diesel of 603 cu in. displacement and rated 182 bhp at 2800 rpm was shown. Hercules Motors Corp. had on display four of its new G.O. and D.D. series four and six-cylinder engines (see AI, Jan. 1).

An unusual presentation was "A Case Study of Integration of Design and Automation," which was given in the form of a dramatization at the luncheon technical session. Ways and means had to be developed for overcoming the plight of an imaginary concern, the Heliotrac Co., whose product and shop equipment had become obsolete and whose operating results had fallen in the red. The situation called for modernization of design, yet manufacture of the end product at the same or lower cost and flexibility for future development. It was concluded the desired objectives could be accomplished by automating manufacturing facilities for engine production and by purchasing such components as transmissions from vendors more economically set up to produce this equipment. The star cast was comprised of A. T. Colwell, Thompson Products, Inc.; L. I. Woolson, De Soto Div.; E. N. Cole, Chevrolet Motor Div.; F. E. Farrell, Bendix Aviation Corp.; C. L. Hecker, Oliver Corp.; and D. D. Robertson, Dana Corp.; all of whom drew upon personal knowledge and practical experience in improvising the dialogue of the session.

During one of the technical sessions, details of the Powermatic transmission for Chevrolet heavy-duty trucks were discussed by H. O. Flynn, Chevrolet Motor Div. This transmission is of the torque converter type, with three automatic drive ranges, and includes a built-in hydraulic retarder for vehicle deceleration. A description of the new unit will appear in an early issue of AUTOMOTIVE INDUSTRIES.

Teflon possesses a number of properties which make it an interesting bearing material, the most important of which are that under certain conditions a very low coefficient of friction, about 0.04 or less, can be obtained with non-lubricated bearings and it can be used

EXHIBITORS IN ENGINEERING DISPLAY

Acushnet Process Co.
Aeroquip Corp.
Aluminum Company of America
Aluminum Industries, Inc.
American Bosch Arma Corp.
American Bosch Div.
Anchor Coupling Co., Inc.
Auto Specialties Manufacturing Co.
Automotive & Marine Products Corp.
Bendix Aviation Corp.
Bohn Aluminum & Brass Corp.
Brush Electronics Co.
Cities Service Petroleum, Inc.
Cleveland Graphite Bronze Co.
Continental Motors Corp.
Consolidated Engineering Corp.
Cummins Engine Co., Inc.
Dana Corp.
Danielson Manufacturing Co.
DeLuxe Products Corp.
Detroit Aluminum & Brass Corp.
Detroit Controls Corp.
Diesel Energy Corp.
Dow Chemical Co.
Dualoc Drive, Inc.
E. I. du Pont de Nemours & Co.
Engineering Castings, Inc.
Eagle-Picher Co.
Fabricon Products Div.
Fairchild Engine & Airplane Corp.
Al-Fin Div.
Fram Corp.
G. H. Leland, Inc.
Gemmer Manufacturing Co.
General Motors Corp
Saginaw Steering Gear Div.
Groov-Pin Corp.
Heli-Coil Corp.
Hercules Motors Corp.
Higbie Manufacturing Co.
Avon Tube Div.
Hoof Products Co.
Jervis B. Webb Co.
Johnson Bronze Co.
Kelsey-Hayes Wheel Co.
Kolene Corp.
Kysor Heater Co.
Le Roi Co.
Leece-Neville Co.
Lincoln Engineering Co.
Lipe-Rollway Corp.
Lisle Corp.
Lord Manufacturing Co.
MB Manufacturing Co., Inc.
Magnaflux Corp.
Meridan Corp.
Flex-O-Tube Div.
Metals & Controls Corp.
Monroe Auto Equipment Co.
Ohio Crankshaft Co.
Owens-Corning Fiberglas Corp.
Performance Measurements Co.
Pierce Governor Co., Inc.
Robertshaw-Fulton Controls Co.
Fulton-Sylphon Div.
Rosan, Inc.
Ross Gear & Tool Co.
S. Sterling Co. (for Allen B. DuMont Laboratories)
Schwitzer Corp.
Sparks-Withington Co.
Sparton Automotive Div.
Stewart-Warner Corp.
Titeflex, Inc.
Torrington Manufacturing Co.
Vickers, Inc.
Victor Manufacturing & Gasket Co.
Waldes-Kohinoor, Inc.
Wallace & Tiernan, Inc.
Waukesha Motor Co.
Zollner Corp.

continuously at temperatures up to 500 F. This was stated in a paper by A. J. Cheney, W. B. Happoldt and K. G. Swayne of E. I. du Pont de Nemours and Co., Inc., outlining the properties and behavior of Teflon tetrafluoroethylene resin and Zytel nylon resin as bearing materials with little or no lubrication. The results of laboratory tests on lubricated bearings made of Zytel were reported for the first time. It was found hydrodynamic lubrication can be maintained with very low quantities of lubricant.

If the concentration of detergent in engine lubricating oils is strong enough to disperse the particles in the oil and prevent their adsorption to the oil filter media, then the particles will be carried through the filter, according to studies bearing on the effectiveness of additive oils and oil filters in reducing engine wear. R. J. Pocock of Ford Motor Co. suggested limiting the detergent to the concentration needed to realize only the beneficial results, or the use of new additives which can be more readily filtered.

The present limitations of the L-4 test, based on a six-cylinder Chevrolet engine and used for measuring certain performance characteristics of oils, was discussed by Dr. R. J. DeGray of The Standard Oil Co. (Ohio) in analyzing possible future course of action. He concluded that the fuel requires better standardization, and that the bearing weight loss procedure requires such modification that it measures the loss due to the action of the oil or its deterioration products. Also that the rating system should be changed so that error is either independent of rating, or proportional to the rating; and that the whole procedure should be tightened in order that the effects of engineering improvement can be measured with statistical significance.

A new research tool, the crank angle — time recorder, for obtaining a permanent record of the time at which various combustion phenomena occur in the engine cycle, was described in a paper by J. A. Warren and J. B. Hinkamp of the Ethyl Corp. Application has included studies to determine those deposit-ignited flame fronts which resulted in knock, the effect of fuel anti-knock quality and additives on surface ignition, the surface-ignition resistance of fuels, and studies of the effect of a number of factors on normal flame movement.

An automatic recording system, the balanced diaphragm remote plotter, for recording cylinder pressure versus the crank angle, was reported by R. R. Bockemuehl and E. F. Weller of General Motors Corp. The new system features curves plotted on a statistically sound basis, remote recording of the pressure-crank angle curve without operator attention, and data recorded in continuous analog form to a relatively large scale on standard strip chart paper, thus eliminating the major disadvantages inherent in previously developed systems. Future developments depends upon requirements, but consideration has been given to the adaptation of the system for recording pressure-volume curves, for automatically computing indicated horsepower, and for recording in digital rather than analog form.

The problems involved in accomplishing a lower drive line to afford lower silhouette passenger cars were reviewed by R. R. Burkhalter and P. J. Mazziotti of Dana Corp. Saying that revised drive line configurations must maintain drive line excitation within acceptable limits, they analyzed various alternates using as a base a hypothetical car of today with underfloor drive line. According to these studies, a 4-in. lowering of the seats would be possible with rear axle motion controlled by a radius rod and using a three-joint installation with center bearing. A seat lowering of 4½-in., which appeared to be the maximum with front engine location, could be achieved with an independent rear suspension, where the axle housing is mounted directly to the frame and drives each wheel independently through a wheel drive propeller shaft, combined with a three-joint drive line with center bearing. Maximum seat lowering of 6½-in. would only be possible with no drive line under the body and utilizing either rear engine, rear wheel drive, or front engine, front wheel drive.

Cold starting characteristics of multigrade oils differ from those indicated by gradings, according to two papers presented at the Fuels and Lubricants Activity session. G. K. Malone and T. W. Selby of General Motors Corp. suggested that classification be based on the oil's determined viscosity at low temperatures and at a specified shear rate. F. B. Fischl, H. H. Horowitz and T. S. Tutwiler of Esso Research and Engineering Co. revealed their findings that mul-

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tigrade oils of identical viscosities at 210 F and ASTM extrapolated viscosities at 0 F, cranked faster or slower than conventional mineral oils of the same 0 F viscosities, depending upon the particular combination of V. I. improver and base oil used. They attributed this to the capillary viscosities of V. I. improved oils at low temperatures being much higher than the ASTM chart predicts, and to temporary losses in viscosity which occur during engine operation. A similar recommendation was made that viscosity measurements under established shearing stresses be used, combined with present SAE viscosity limits, to define winter grades of oil.

With higher output engines in recent years requiring greater cooling capacity, it has been necessary to provide larger radiators, higher capacity fans, etc. What is being done to develop fans and fan drives to lower these parasitic power losses was discussed at a symposium on the subject by engineers from five companies. It was generally agreed that for satisfactory operation, fan speed or declutching of the fan must be controlled thermostatically according to the coolant temperature.

H. A. Reynolds, Harrison Radiator Div. of General Motors, stated that the most promising type seems to be the controlled maximum speed drive, which limits the maximum fan rpm at some predetermined speed by declutching. Cost, reliability, efficiency, and space requirements are the most important factors in the selection of such a device. He predicted a tremendous market in the automotive field for a dependable and inexpensive unit.

The passenger car fan, water pump, generator, air conditioning compressor, and power steering have their maximum delivery requirement at speeds around 2200 to 2500 rpm and any further speed increase results in additional parasitic horsepower and shortened life span, it was pointed out by K. A. Beier, vice-president in charge of engineering and research, Schwitzer Corp. He stated that an accessory drive to control all of these units is very desirable and that his company is well on the way to a solution for this problem. Schwitzer has developed a drive mechanism that varies fan speed in accordance with cooling requirements and in the near future experimental units are to be tested on truck, bus and off-the-highway vehicle installations.

James H. Booth, chief engineer, Thompson Products, Inc., presented a report on three types of thermostatically controlled fans that Thompson has under development. A dry clutch type, particularly applicable for passenger car and light truck applications, is both automatic and thermostatic. It provides for the heat overrun on a fast stop by resuming operation at idle regardless of water temperature.

Another Thompson development is the wet clutch type for fan without water pump. Engagement or disengagament of a cone clutch, which is part of the belt driven fan housing, is produced by oil pressure controlled by a thermostatic valve.

A fluid coupling type of fan drive for heavy trucks also was described by Mr. Booth. The fan is operated by filling the coupling with engine oil and disengaged by emptying the coupling. Flow of oil is regulated by a two-way thermostatically controlled valve. Further refinement can be accomplished by incorporating a cone clutch with the coupling to increase efficiency.

In 1947 GMC Truck and Coach Div. of General Motors released for production a limited quantity of a belt-driven variable pitch fans for intercity coach operation. At present 2700 fans of this type are in operation and over 2 1/3 billion miles have been accumulated with them. D. F. Lemaux, assistant experimental engineer of that GM division, analyzed the minimum saving at $1200 in fuel cost per vehicle on the basis of an average life expectancy for a vehicle at eight years. For a maximum of 10 per cent improvement in fuel consumption reported, the savings would be $4000 per vehicle. Mr. Lemaux also described a fluid coupling type fan drive with the two torus members enclosed in an aluminum housing. A thermostatic oil valve controls its operation.

R. W. Wantin, chief truck engineer, Ford Motor Co., presented data for a thermostatically controlled fan installation on a recent cross country trip of 2183 miles from Kingman, Arizona to Romulus, Michigan. The vehicle was a tractor tandem semi-trailer unit with a gross train weight of 51,000 lb. The cumulative engine operatng time was 67 hr and 30 min. and the cumulative fan non-operating time was 26 hr, a saving of 39 per cent.

Following are abstracts of a few of the many interesting papers.

The Continental Mark II Frame Structure

By H. F. Copp
Ford Motor Co.

In designing a car with a low overall height, the main difficulty lies in providing a comfortable seating arrangement. Conventional frame structure prevents lowering the floor pan appreciably, and chair-type posture is sacrificed if the seats are merely lowered with respect to the floor. A different kind of frame structure was clearly indicated, if seating standards established for the new Continental were to be achieved.

The seating package dimensions in the new car ruled out the use of the conventional X-member brace in the frame. In addition, continuous side rails were not feasible because of the necessity for 16-in. right-angle offsets behind the front wheels, where the side rails must move outward to allow maximum foot well space in the front seat floor. These limitations created a challenging problem in the attainment of adequate torsional rigidity.

The first full-size experimental frame was built in three sections. The front section comprised double-flanged box section side members, joined by two tubular cross members. The front section was attached to the central section by a tubular cross member which passed through the side members of both sections. At its center,

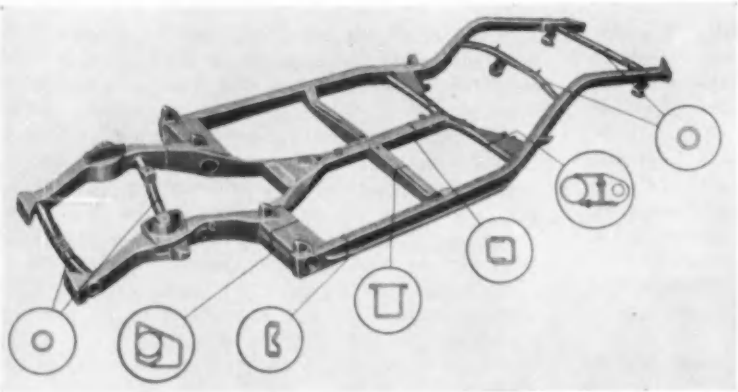


Fig. 1—The production Continental frame assembly

this third cross member was offset to the rear to make room for the transmission housing. Tubular braces angled forward from the ends of the center section side rails to the side rails of the front section, and gussets reinforced the joints between the front section inner rails and the third cross member.

Like the front section, the central and rear section side members were box sections, joined by tubular cross members, but the wider central section was further reinforced by a tubular center member, or "backbone," connecting the third, fourth, and fifth cross members.

The offset between the central and rear sections, although not so severe as the front offset, was heavily reinforced with channel section gussets. This was done because the fifth cross member had to take a large measure of the wheel reaction through the rear spring front hangers, which were to be mounted on the inside gussets.

Test results on the first frame were very encouraging. Torsional rigidity was more than twice that of the average 1952 Lincoln hardtop frame, and bending deflection was about 24 per cent less.

As we suspected, the most critical areas of this frame were at the connections between the discontinuous side rails and, in the second frame design, we extended the central section side rails at front and rear and joined them to the front and rear sections with short tubular members to form double trunnion connections. The small rectangular spaces thus formed were enclosed by capping plates at top and bottom. This construction resulted in a substantial reduction in bending deflection, as well as increased torsional rigidity, in these critical areas. However, the overall strength of this frame was somewhat less than that of the first design because of reduced metal thickness in all principal members.

While the second frame design was being tested, some minor changes were made in seating package dimensions. The "A" point of the rear seat cushion was raised slightly, permitting us to employ continuous side rails for the central and rear sections of the frame. At the same time, the engine was moved back 1.5 in., due to a relocation of the passengers. This meant a deeper offset in the third cross member. Since this was impractical, a new construction was indicated.

In the third frame design, this cross member and the longitudinal center tube were replaced by a box section Y-member. On each side, the connection between the front and center section side rails was changed from the double trunnion to a larger diameter tube, which passed through the front side rail and was joined to one branch of the Y-member. As before, gussets were use to blend these joints smoothly together, and channel sections were welded to the tube between the center and front side rails. A capped, inverted hat section formed the fourth cross member in place of the tubular member of the second design. Except for its smaller size, this member was similar to the one employed in the first frame.

Torsional and bending rigidity tests on this third frame design supported our original choice of an enclosed rectangular section for the fourth cross member, which proved to be quite effective in torsion, but which had little value as a bending member. The new Y-member, on the other hand, contributed effectively to both bending and torsional rigidity because of the more efficient juncture between the discontinuous side rails at the dash. In bending, this front connection works as a torsion member and, through the Y-member, reduces the bending moment at the center of the fifth cross member.

With a few minor revisions, this design became the production Continental frame. In the chart below, it is compared with the 1956 Lincoln hardtop frame as to torsional rigidity and gross weight.

	Maximum Torsional Rigidity (lb-ft/deg)	Gross Frame Weight (pounds)	Torsional Efficiency (lb-ft/deg per lb)
Experimental Frame No. 1..	3189	594	5.36
Experimental Frame No. 2..	2466	436	5.65
Production Frame	3013	535	5.63
1956 Lincoln hardtop Frame.	1995	358	5.57

Although the weight of the production frame is rather high, its efficiency, in terms of torsional rigidity-to-weight ratio, is much greater than we had expected to achieve in a ladder-type frame.

In Figure 1, the production Continental frame assembly is illustrated. Overall static rigidity tests of the assembled frame and body show that the Continental frame contributes almost fifty per cent of the total rigidity in both bending and torsion. The contribution of the 1954 Lincoln frame, on the other hand, amounts to only about thirty per cent.

The New Dynaflow Automatic Transmission

By R. J. Gorsky
Buick Motor Div.
General Motors Corp.

As can be seen from the 1954 vs 1955 converter comparison, the 1955 transmission has two completely different sets of characteristics (Fig. 1). The solid lines show the 1954 twin turbine converter. The dot-dash lines show the 1955 variable pitch twin turbine at high angle and the dash lines show the 1955 variable pitch twin turbine at low angle. The shaded areas show how the engine speed at low angle was reduced, how the efficiency was improved, and how the torque ratio or performance was increased (at high stator blade angle).

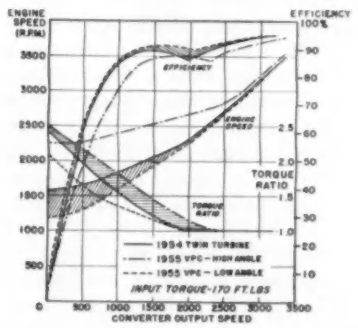


Fig. 1—Comparison of Buick 1954 and 1955 transmissions

To further increase the low end car performance, a fixed-blade stator, located between the first turbine and second turbine, has been added to the 1956 twin turbine Dynaflow. The pump member energizes the oil and causes it to flow to the first turbine member. Here its flow direction changes from the entrance end to the exit end of the blade causing a driving force to be imposed on this member. This driving torque is multiplied by the converter planetary gear set before it is fed into the converter output shaft. The fixed-blade stator member then redirects the oil flow so that it will enter the second turbine member. The second turbine is splined directly to the converter out-put shaft and transmits torque supplementing the first turbine torque during acceleration. At higher car speeds and at cruising the second turbine transmits all of the driving force.

The oil leaving the second turbine then enters the variable pitch stator where it is redirected before re-entering the converter pump member to repeat this cycle. At stall condition, all members except the pump are stationary. The direction of oil flow changes as the power being transmitted and the car speed vary. This causes the turbines to increase in rotational speed and the stators to start overrunning. The stator piston moves in response to linkage from the throttle control mechanism. An added resistance at the end of throttle pedal movement is used so that the driver will realize that further movement will put the transmission into performance range.

A variety of materials and manufacturing methods are used in making the variable pitch stator and overrunning clutch assembly. The stator overrunning clutch is of the cam and roller design. Accordion pleated type roller energizing springs are used.

The rear stator blade carrier is made of a shell molded iron casting. This part is rough machined, removing 0.030-0.045 in. from all surfaces. The front stator blade carrier is also made of a shell molded iron casting. This part contains the support bearings, which are steel backed bronze bushings.

The front and rear carrier halves are bolted and doweled together. This matched assembly is then finished machined, removing 0.015-0.020 in. for finish cuts. The 20 holes for the stator blade cranks are drilled and reamed to a tolerance of 0.002 in. The centerlines of these holes are in the parting line plane of the two carrier sections.

A close hole tolerance is required to minimize oil leakage between the cranks and the crank bearings. The centerline parting permits the usage of a crank and blade sub-assembly, which facilitates the initial assembly and any service disassembly.

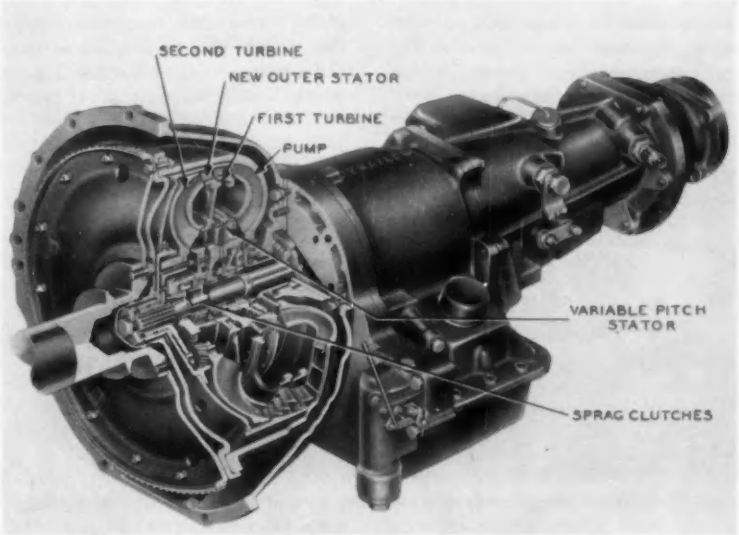
The stator blade crank is made from close tolerance SAE 1018 drawn wire of 0.1540-0.1550 in. diam. The off-set for the crank is made in a four-slide machine. The serrations which lock the stator blade to the crank are formed by rolling. This part is then heat treated to increase its strength and wear resistance.

Variable pitch stator blades are a hot aluminum extrusion, cold drawn to maintain uniformity. The cross section of this cold drawn stock is being maintained within 0.002 in. of the exact contour shown on the drawing. The stator blades are cut from these hot extruded cold drawn bars. The ends are broached to form a small thrust area. The crank hole is drilled and reamed.

The throw of the crank is positioned in its proper relation to the blade and the crank is pressed into place. The interference fit between the serration on the crank and the hole in the blade locks these two parts together.

The stator piston or crank actuator is a sintered powdered iron part. Labyrinth grooves are machined on the ID to provide oil sealing and a groove is turned on OD to accommodate a cast iron oil sealing ring. The weight decrease of this part during machining amounts to only 23 per cent.

The outer ring or shroud is a sheet metal stamping. First, a cup is formed from which the draw flange and the bottom are trimmed off, leaving a cylinder of seamless tubing. This cylinder is then placed over a plug and pressed axially between form controlling dies. This causes the center section to bulge out and get squeezed together, thereby forming



Buick Dynaflow for 1956

a very rigid T section. The holes which accommodate the outer ends of the crank are pierced in a radial outward direction, so that a smooth surface will be retained on the ID for the stator blade thrust area. No machining is done on this part.

The rear stator blade carrier, the stator blade and crank assemblies, the stator piston, and the outer shroud are assembled before the front stator blade carrier is bolted on to complete the assembly of this unit.

A sprag type overrunning clutch is used with the converter planetary sun gear. To maintain concentricity between the outer and inner races, a bearing is pressed into the front end of the sun gear and bored to size, locating from the ID of the sun gear race-way. To the rear is assembled a narrow bronze bearing having very close diametral tolerances and concentricity.

The overruning unit is a double cage full phasing sprag clutch. One of the features of this type of overrunning clutch, in comparison to the cam and roller type, is that it requires less space.

The first turbine is a semi-permanent mold aluminum casting. Early 1955 parts were made using individual plaster cores for each opening between the blades. A flash resulted in the casting, where these cores mated together. This problem was solved by the development of a one-piece core.

The fixed-blade stator is mounted on narrow full floating bearings between which is the stator overrunning clutch (sprag type). This member is a semi-permanent mold aluminum casting. The addition of this element to the 1956 Dynaflow accounts for the improvement in performance. The stall ratio has been increased from 2.1:1 to 3.2:1 for low stator blade angle and from 2.4:1 to 3.5:1 for high stator blade angle.

A die cast stator member has been produced and is now undergoing durability tests. The trailing end of these blades are being die cast to a thickness of 0.020 in. The samples submitted for test and the tests results to date make this part look most promising as a die cast prospect.

A semi-permanent mold cast aluminum second turbine was used in the 1953-1955 Twin Turbine Dynaflows. This part is being supplanted by a sheet metal assembly. No performance or weight penalty was encountered in making this change. The thinner sheet steel sections off-set the greater specific weight of the material used.

The 1955 converter housing was a sand cast iron part weighing 24.2 lb. The heavy ribbing used was not for structural purposes, but for acoustic reasons. A full permanent mold cast aluminum converter housing which weighs 7.3 lb is now being used. Instead of ribs, this part has convolutions in the conical wall to provide the most rigidity and strength with a minimum amount of material.

The plain bronze thrust washer between the sun gears of the transmission planetary gear unit has been replaced by a needle thrust bearing. Testing was started on the bearing some time ago. Due to the increase in thrust loads caused by the higher converter torque ratio, a greater capacity bearing was needed. This was accomplished by the needle thrust bearing, in about the same space formerly needed for the plain bronze thrust washer.

Forgings and Modern Fighter Plane Producibility

By C. R. Kramer and A. Kastelowitz
Republic Aviation Corp.

As our designs at Republic develop and advance new problems arise. Not only is the structure thinner and more highly loaded but certain parts are subjected to high temperature while under load. With our previous experience with forgings and the new 35,000 ton presses available it was only natural that forgings should play a large part in our new designs.

One of the later Republic designs uses 229 forgings of both steel and aluminum alloy, or a total of 436 pieces per airplane. These forgings weigh better than 5500 lb per airplane. Note that from the F-84 to this design, the number of forgings did not increase appreciably but the weight almost doubled, an indication that the size of forgings is increasing. The final machine pieces weigh less than 3200 lb. This airplane is still classified but we can show some of the forgings. Fig. 1 shows one of the larger and more interesting ones. Unfortunately no attempt was made to use built-up construction on the prototype so that we cannot obtain a comparison. We were so convinced of the weight saving, however, that these parts were all hogged out of billet stock. As a point of interest, some of these parts were so highly compacted that a built-up assembly

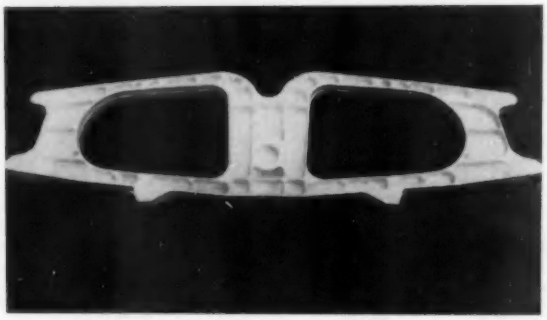


Fig. 1—Frame forging for new Republic aircraft

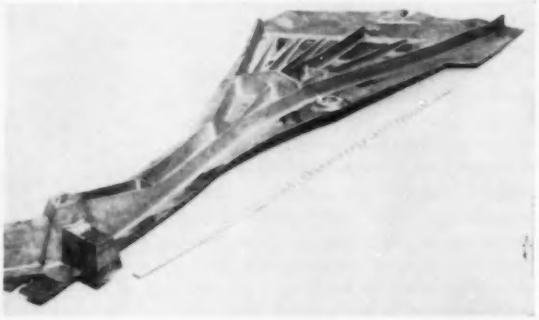
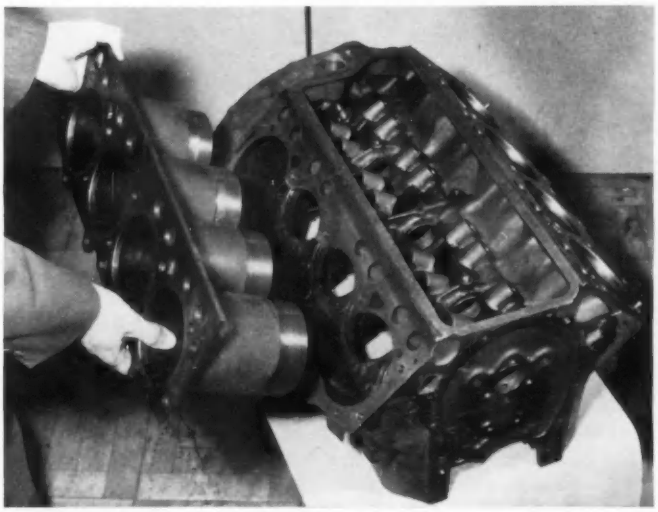


Fig. 2—Wing spar cap which forms part of aircraft outer wing contour



Cylinders and top deck are a separate assembly in the newly developed automobile engine block.

Newly Developed Cylinder Block Eliminates Need for Sand Cores

A NEW way to manufacture automobile engine blocks, developed by Perfect Circle Corp., Hagerstown, Ind., would eliminate or drastically reduce the baked sand coring now used in engine block construction. In the Perfect Circle design, the entire cylinders and top deck are not included in the casting of the block, but are a separate assembly. The centrifugally cast iron cylinders are silver brazed to a steel top deck. The unit is sealed to the block by a paper neoprene gasket and the lower ends of the cylinders are sealed by rubber rings where they pass into the crankcase.

According to Perfect Circle engineers, the new design will result not only in a more durable engine but also has many advantages to manufacturers. Among these listed are: Larger cylinder diameters are possible on given cylinder center distances; softer iron can be used in the block proper, which will permit up to 25 per cent more blocks to be machined on a given set of machine tools; better material can be used in the cylinders; cylinder wall thickness is uniform and precisely controlled; engine block scrap from water leaks and other defects is reduced; cylinders in an engine of this design are not subject to structural stresses.

With this design it is possible to readily build engines of a considerable range of bore sizes on the same basic block; cylinder replacement is simplified.

Finally, this design is particularly adaptable to die cast aluminum blocks, which have been the subject of considerable research and interest in the automobile industry.

It is reported that one major automobile manufacturer already is testing the new design and that other leading manufacturers plan to test it.

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would be impractical if not impossible to design, under the circumstances.

One of these impossible forgings brought about a new process. The wing spar cap is a long, flat forging and forms part of the outer contour of the wing. (Fig. 2) This piece is 26 in. wide, 76 in. long, and only 5½ in. deep at the deepest part. In essence, it incorporates skin, ribs and formers into a single part. The problem is to either forge or machine this to contour. As you can see, the contour change was appreciable, and could be machined only by a hydraulic profile planner or Keller using a ball end mill. Both methods are very slow, involving considerable finishing after machining to achieve the surface required.

Early in the program, therefore, Republic and Wyman-Gordon, in discussing the part, came to the conclusion that die quenching the part might provide a satisfactory answer. Quenching fixtures have been used in the forging industry for years but die quenching of aluminum forgings is a relatively new process that provides means of heat treating material while confining it to the desired configuration in a form die.

In the initial tests conducted with the 7700 ton Verson press of Wyman-Gordon it was revealed that the die quenched part developed a concave bow of approximately one-half an inch in five ft. Later with a different quenching procedure this same part bowed in the opposite direction approximately 1/16th in. from the contour. This result proved the possibility of controlling the overform and springback effects by varying the quench procedure.

The final parts formed by this process were within 1/32 in. of the required contour. It is believed that further improvement can be made by additional control of the quenching procedure. However, until this can be checked and proven, the parts are presently shipped in the "W" condition, and hand straightened as required at Republic and aged. This is still, by far, the most economical way of manufacturing this part, so that in production all eight spar caps have been manufactured this way.

Note that 10 years ago when we used smaller forgings more compatible with the size of presses available we retained 70 per cent of the forging after machining. Five years ago when we went to large complicated forgings the size of the press and the state of the art forced us to machine away in chips as much as 50 per cent

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Special Storage and Handling
Reduce Costs of Truck Production

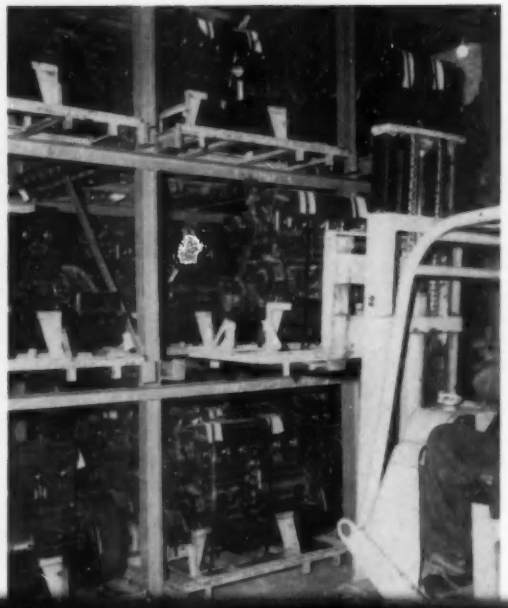
These pallet racks accommodate standard wooden pallets on the top three shelves and tub-storage items on the floor level. Parts are filed by rack bin location.

A NUMBER of interesting materials storage and handling innovations, including a gravity-feed engine rack, a variety of pallet racks, tubular stacking racks, and parts delivery carts, have helped Four Wheel Drive Auto Co. streamline and reduce the cost of its truck production.

Faced with the problem of excessive costs in low volume production of its four- and six-wheel-drive heavy-duty trucks, FWD revamped its entire manufacturing facilities at its Clintonville, Wis., plant. This included relocating machines and assembly lines, replacing some older machines, completely overhauling the materials storage and handling. This last phase is among the most interesting in the FWD production modernization because most of the materials handling alterations paid for themselves in dollar savings in six months to a year.

One of the firm's biggest problems was engine storage. A new indoor engine rack equipped with gravity-feed skate conveyors replaces the old method of storing engines outdoors in delivery crates to await use. The engine rack has 14 compartments, each 5 ft wide, 3 ft high, and extending the full 30-ft length of the rack. Engines are delivered strapped to metal pallets the width of the compartments and are lifted by fork truck into position at the rear of the rack. Each palletized engine rolls on the slightly-pitched conveyor toward the front of the rack and against the engine pallet in front of it. This rack accommodates 160 truck engines.

In addition to this special gravity-feed rack, standard pallet storage racks also were constructed in a variety of sizes for storing other truck parts. Double pallet racks in sections 60 ft long, 6½ ft wide, and 10 ft high, with an aisle on each side for easy access, were built to handle smaller truck parts. These racks have three shelves plus floor level storage. Each section has a double row of compartments, with each compartment 4½ ft wide, 3¼



Skate conveyor rack provides handy gravity-feed engine storage in FWD plant. First engines in move to front of rack and are first ones out.

Variety of supply carts used for distributing parts to production stations include dolly for moving tub-stored parts, A-shaped rack for exhaust pipes and similar parts, flat-decked cart for moving small parts sorted into stacked pans, U-shaped rack for tubing and allied parts, and low dolly for distributing pallets holding axle parts.

ft deep, and 2½ ft high, sufficient to accommodate standard 3 by 4-ft pallets and their contents.

Larger pallet racks were made with compartments 5½ ft high, 12 ft wide, and 4 ft deep. These were designed for storage of transmissions, springs, and extra engines which are awaiting transfer to the gravity-feed rack. Each compartment of these extra-large pallet racks will hold three standard-sized pallets.

Some large truck parts, such as steering gears and propellor shafts which do not lend themselves to storage on standard-sized pallets, are stored on tubular stacking racks. These all-welded racks can be stacked four high with the parts stored crosswise on the rack. Triangular locating pins assure safe stacking of the tubular racks and parts can be transported to the storage area and later to the production stations on the rack sections by fork truck.

Engines, transmissions, and similar large parts are moved on pallets by fork truck. But smaller parts are more readily moved on parts supply hand trucks. These trucks are mounted on casters or

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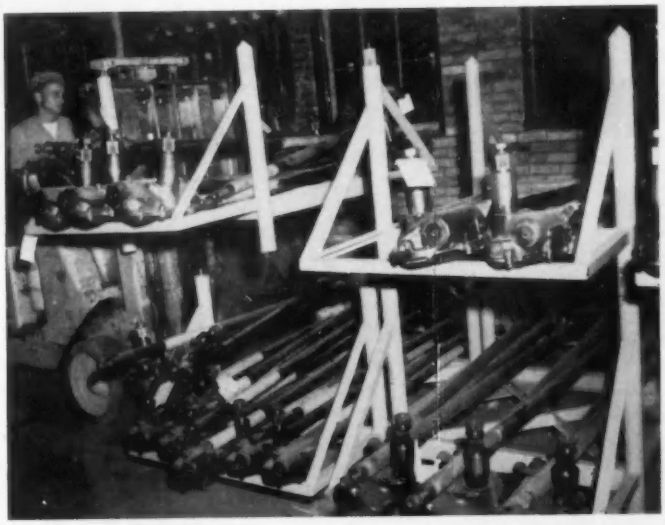
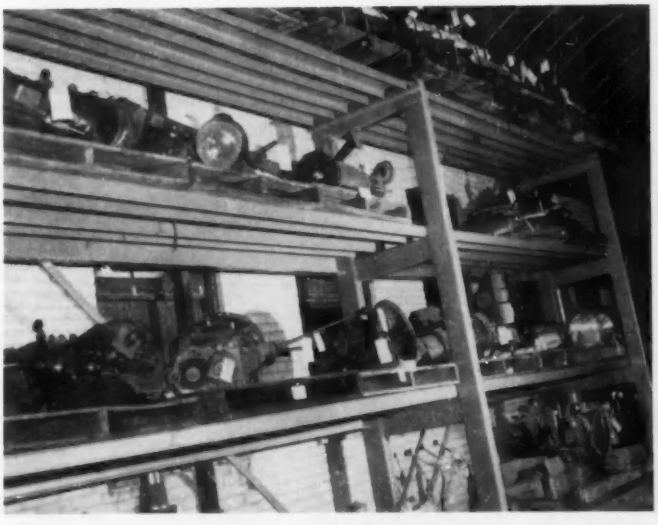
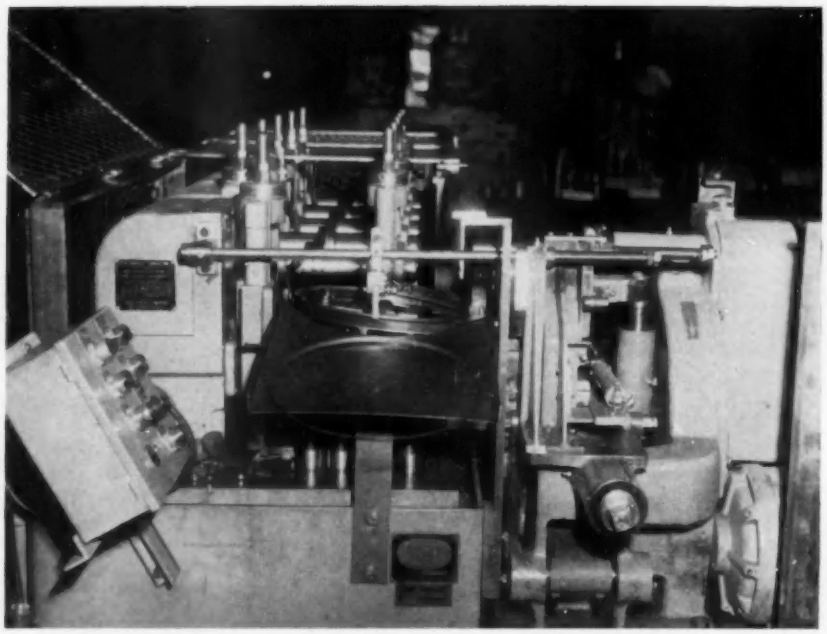




Above right—Larger truck parts such as steering gears and propellor shafts are stored on tubular stacking racks, which can be stacked four high. Locating pins assure safe stacking.

Below right—Huge pallet racks are designed for storage of transmissions as well as for extra engines awaiting transfer to the gravity-feed engine rack.

Large Diameter Rings Produced Automatically on Rolling Mill



Yoder rolling mill equipped for automatic production of sealing rings

AN ingenious method of producing large diameter seal rings at high production rate has been developed by the Detroit Transmission Div., General Motors Corp., at Willow Run. These rings are produced automatically in the Yoder rolling mill illustrated here, later are spot welded to the flywheel.

The operation begins with the feeding of CR strip steel—0.045-0.050 in. thick and 0.422 in. wide—in coils through the first set of five rolls designed to bend the strip in the form of a 90-deg. angle. As the bent stock leaves the forming rolls, it is forced against a bronze shoe and is constrained to bend in the form of a circle. As the end of the coil completes the circle, it trips a cutter to part it from the continuously moving angular strip.

At this point two plungers located on opposite sides force the ring upward out of the bending form while the reject arm flips it onto the chute as shown. Despite the speed with which this operation is performed, this ring is made to close tolerances. For example, the gap between the ends of the ring has a maximum allowance of 0.030 in.

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Numerous Western Exhibits Expected at Leipzig Fair

Greater Western participation is expected at the Leipzig Fair in Eastern Germany opening on Feb. 26. From the British automotive industries, Leyland, Rover, and David Brown Tractors will exhibit, in addition to Standard and Massey-Harris-Ferguson which have been at Leipzig for the past two years. Rolls-Royce, Henry Meadows and The Brush Group will be among the British makers of Diesel engines taking part.

This year there will be an international machine tool section, and it is understood that the space taken by West German concerns will be considerably greater than in 1955. Manufacturers from France, Switzerland and Belgium will also be represented.

Russia is planning to show a wider range of automatic equipment. Other Communist machine tools on display will be from East Germany, Czechoslovakia, Poland, Hungary and China.

Mexican Automobile Show Has International Flavor

The first Mexican International Automobile, Motorcycle, and Bicycle Exposition in Mexico City recently gave thousands of visitors an opportunity to see an extensive display of motor vehicles from all parts of the world. Many of them, such as the Swedish Volvo and the Czechoslovakian Motokov, had not been previously seen in Mexico.

Only major countries not represented were Russia, Japan, Austria, and Holland, due to a lack of time for shipping exhibits. However, these nations are expected to take part in next year's show.

Warner Sets Up Agreements With Two German Producers

Acquisition of working agreements with two prominent German industrial manufacturers has been announced by Warner Electric Brake & Clutch Co. One concern, Georgii-Kobold of Stuttgart, has been licensed to make Warner electric clutches for overseas markets. Schmiedag Aktiengesellschaft of Hagen, Westfalen—the other firm involved — will use Warner electric brakes on the axles it produces for the German automotive industries.

The signing of agreements with the two companies increases Warner coverage in Western Europe. Westool, Ltd., England, and Warner-Electric, Ltd., Zurich, Switzerland, were the first two companies in the Warner overseas network.

Reinforced Plastic Dies

Permit More Frequent Model Changes in Limited Production Cars

Here workmen are building up the form for a section of the huge die mentioned in the text.

LAST year the work being done with epoxy-type resin reinforced plastics at Chrysler Corp. in the making of prototype parts, construction of inspection fixtures, the making of press dies, and short production runs of sheet metal parts in the plastics experimental shop in Highland Park was described in AUTOMOTIVE INDUSTRIES, June 15.

In addition to the Highland Park plant, the Chrysler Exeter plant in Detroit has been making large plastic dies for a long time as well as production runs of large steel stampings for limited production vehicles. According to a recent release, the utility of plastic dies for limited production runs, as well as for emergency use while steel dies are being made, is of major importance. For one thing, Chrysler has found that reinforced plastic dies can be made considerably faster and are 30 to 60 per cent less expensive. This alone means that more frequent model changes can be made in limited production cars, trucks, or experimental models without the usual cost penalty.

An outstanding example of the cost and time-saving potentialities inherent in this technique is the 13-ton, three-piece reinforced plastic roof die used in the production of the Crown Imperial limousine. Some years back, if the die had been made of steel the cost of each roof panel — and consequently, the cost of the car — would have been much greater because of higher tooling cost. Moreover, there would have been none of the present flexibility of design change.

In making a large plastic die at Chrysler, the first step is to prepare the usual wood model of the die or a handmade prototype

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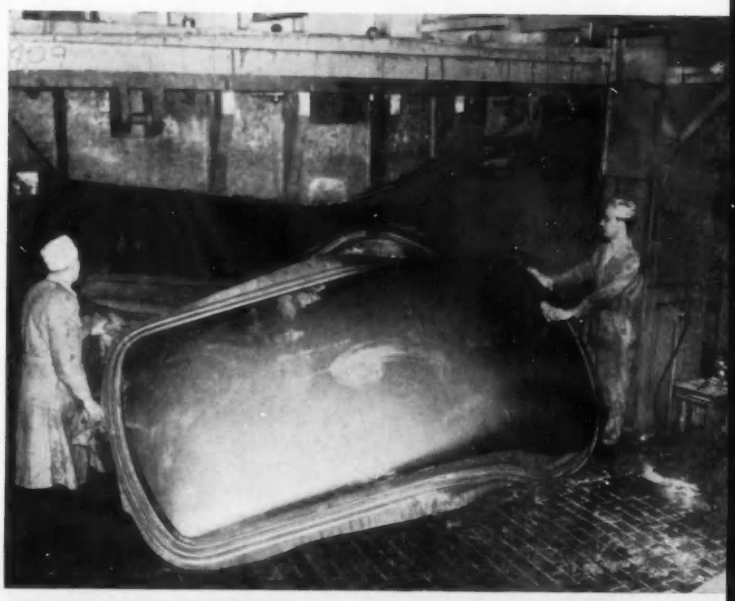

Top right—Roof panel for the Chrysler Crown Imperial produced with the 13-ton plastic die. Bottom right—Plastic headlinings for the roof panel also are made at Exeter. The operator seen here is laying-up strips of resin-impregnated Fiberglas cloth to make up the headlining.

AUTOMATION NEWS REPORT

AUTOMATIC CONTROLS

PRODUCTION — VEHICLES — AIRCRAFT

By Paul Kennedy

CONTOURING

Aircraft builders must consider production lots of 25 to 100 pieces, in thinking about automation. But according to methods engineers at a recent conference, automatic machines which require no operator may be the key to economical production in small quantities.

Tracer control will come into wide use long before tape control is in every smaller shop, believes Charles Morlath of North American Aviation. He explained that NAA has converted a number of knee type horizontal and vertical milling machines to automatic operation with hydraulic tracer equipment. It also built what it calls the cavity mill, a machine with two opposed cutting heads and a three dimensional pencil tracer. The machine operates on both sides of a symmetrical part, and does away with straightening operations. Patterns are mounted on the carriage rail bed away from the work table. Plans are to develop a small 3-D milling head that can be positioned in any angle around large ribs and spars; parts 10 ft long. Four to six such units could work at once, all mounted on a standard, very rigid work table. Tracer movements should be 12 by 12 by 8 in., spindles should have 3 to 10 hp. Mr. Morlath believes every aircraft manufacturer could use 25 to 50 such units. He adds that accessory or machine tool builders should provide tracers which can be converted to tape control, which need no feedback system or slave cylinder adaptations and which will automatically trace the center of a pocket.

It is more economical to buy a special machine for a particular skin than to tool up a huge universal skin mill, said W. B. MacKay of Douglas Aircraft. Where $40,000 normally would be spent on tooling for a single part on a $250,000 machine, the same amount can be used to build special machines that will work faster than standard machines available today. The conference was called by True-Trace Corp. of El Monte, Calif.

EXPERTS PREDICT

The industry which makes automatic controls is on the threshold of the brightest year in history, according to executives of Minneapolis-Honeywell. P. B. Wishart, president, stated the investment of industry in automatic controls now represents 8 to 10 per cent of the total spent for facilities. In 25 years the sales of controls have increased twice as fast as the increase in the general economy. However, new developments will come more gradually than some predict, said H. F. Dever, president of the firm's Brown Instrument Div.

"I think [automation of tool setting and sharpening, gaging, etc.] will cause us to change our concepts of manufacturing that involve selective assembly . . . It is only an admission that we are capable of inspecting parts much closer than we can make them."—J. J. Jaeger, v-p of Pratt & Whitney Co., Inc., at New England Conference of American Society of Quality Control.

"The curve of improvements in relays becomes asymptotic to a definite number of operations, which is relatively small in comparison to a machine lifetime . . . controls that will outlast the machine are possible only if there are no moving parts, no vacuum tubes, in fact, nothing to wear out. Such a system will have contactless pushbuttons and limit switches."—T. Turner and C. Lynn, Westinghouse, at annual meeting of American Society of Mechanical Engineers.

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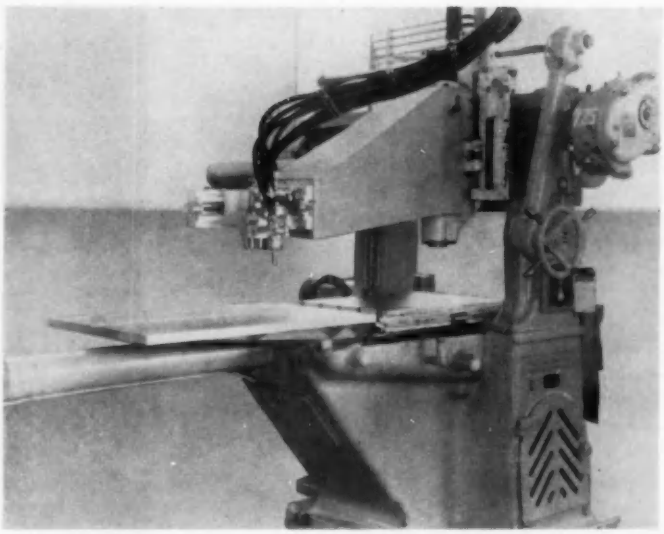
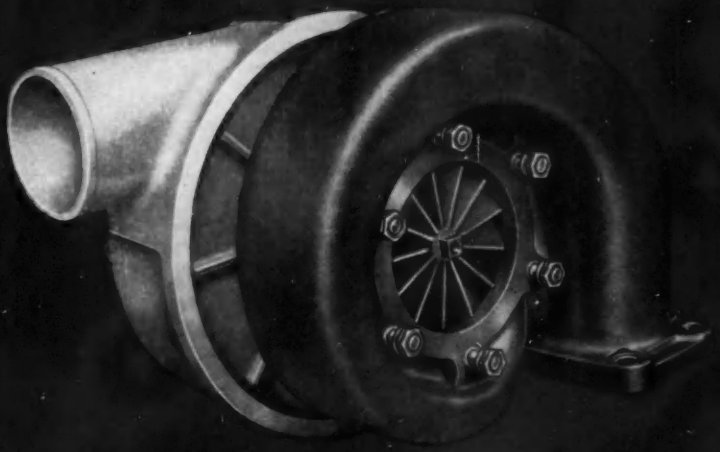


True-Trace conversion of a P&W 30-in. hand profiler into a 360-deg automatic milling machine for small-lot production

SCHWITZER

TURBOCHARGERS



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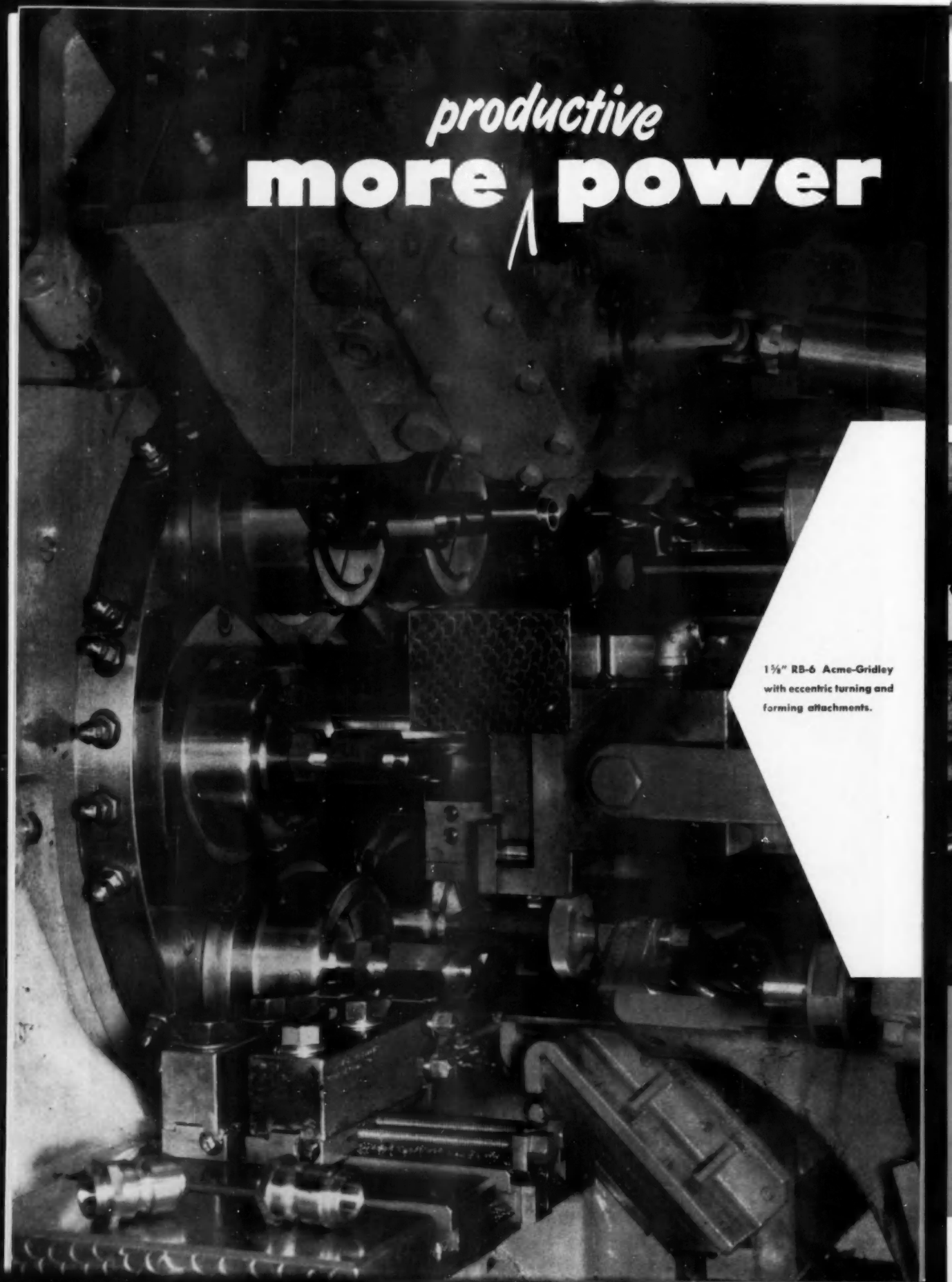
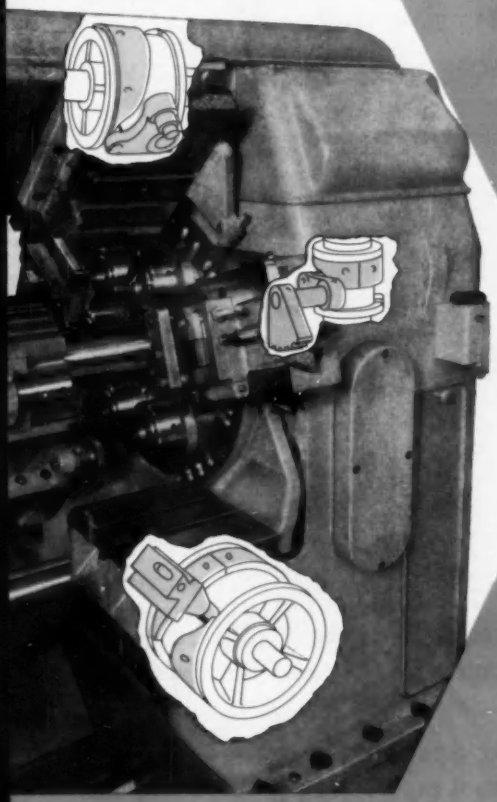


1⅝" RB-6 Acme-Gridley with eccentric turning and forming attachments.

to you!

Acme-Gridley independently-operated direct cross-slide camming



Lets you use maximum machine horsepower for rapid metal removal—without chatter and at predetermined accuracy—throughout an entire run. Basic design of Acme-Gridleys built for heavy cuts calls for proper distribution of "beef" in the machine frame to rigidly support top, bottom and intermediate slides so that they can transmit power to the tip of the tool with no linkages.

Cross slides operating from their own cam drums not only improve overall machine efficiency, but extend the range of applications for which the machine can be tooled. And when, as in the case of Acme-Gridleys, ample frame strength is combined with short coupled power transmission to the tool, you've got a combination that pays off in two ways—improved performance and reduced maintenance.

LET US TELL YOU MORE ABOUT
***Acme-Gridley* BASIC DESIGN**

Independently-operated, direct camming is but one of many BASIC DESIGN features which are responsible for Acme-Gridley's outstanding performance records. May we send you additional information? Or, better yet, let us send a representative to discuss possible production short cuts with you.

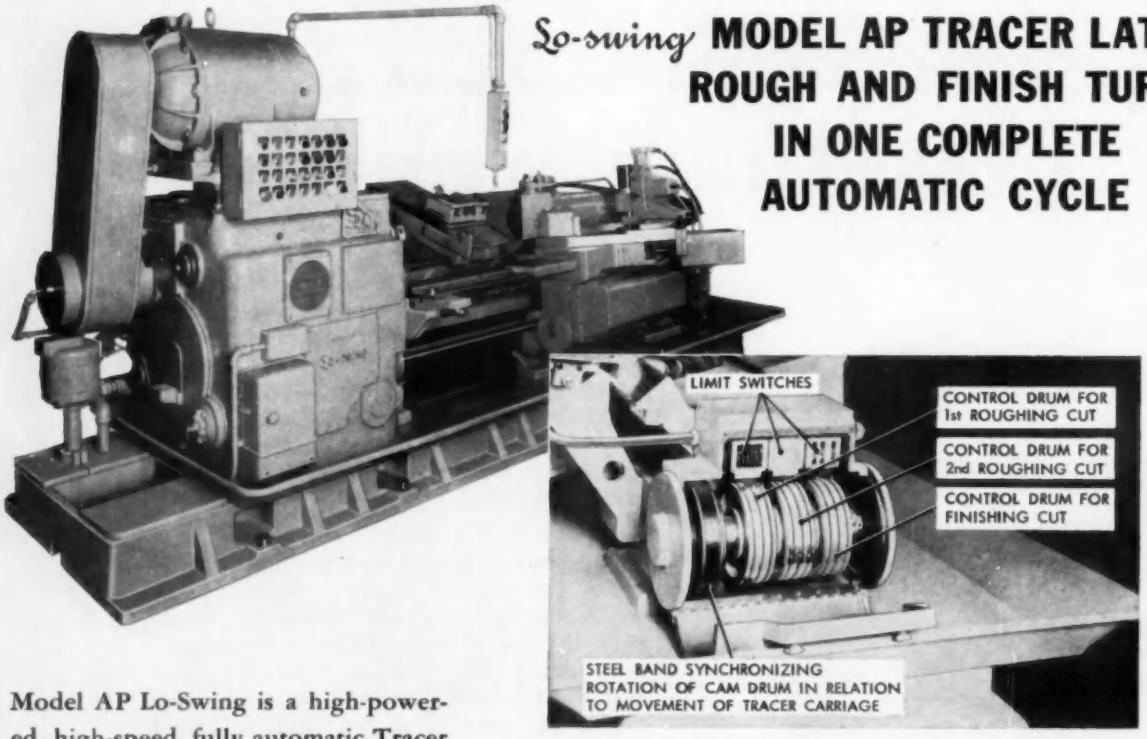
National Acme

THE NATIONAL ACME COMPANY, 173 EAST 131ST STREET, CLEVELAND 8, OHIO

SALES OFFICES: • Newark, N. J. • Chicago, Ill. • Detroit, Mich.

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK


LIMIT SWITCHES
CONTROL DRUM FOR 1st ROUGHING CUT
CONTROL DRUM FOR 2nd ROUGHING CUT
CONTROL DRUM FOR FINISHING CUT
STEEL BAND SYNCHRONIZING ROTATION OF CAM DRUM IN RELATION TO MOVEMENT OF TRACER CARRIAGE

Lo-swing MODEL AP TRACER LATHE ROUGH AND FINISH TURNS IN ONE COMPLETE AUTOMATIC CYCLE

Model AP Lo-Swing is a high-powered, high-speed, fully automatic Tracer Type Lathe which can be set up easily and can be operated by semi-skilled labor. Since it uses a simple type of master template to reproduce size and profile, it is well suited for small and medium lot production.

The illustration at right shows the graduated control drums which control all movements of the front tracer carriage and which initiate feed movement for the back squaring attachment when used. Control cams are graduated for rapid setting.

Write for Bulletin APT 56D

FEATURES OF THIS NEW LO-SWING TRACER LATHE

- Rough and finish machines in one complete automatic cycle.
- Back squaring attachments permit additional facing and undercutting operations synchronized in the machine cycle.
- Rapid traverse movement to the tracer slide advances cutting tool rapidly to the work and also relieves slide on the return stroke.
- Rack and pinion longitudinal feed permits long carriage travel.
- Motors up to 50 HP can be used on heavy roughing operations.

Lo-swing MODEL AP AUTOMATIC TRACER LATHE

5th in a Series

OF HIGH PRODUCTION CASE HISTORIES

Baird Automatic Chucker again hits *PEAK PRODUCTION*

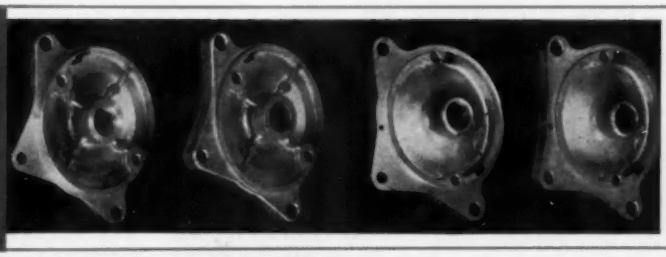
ASK BAIRD ABOUT IT

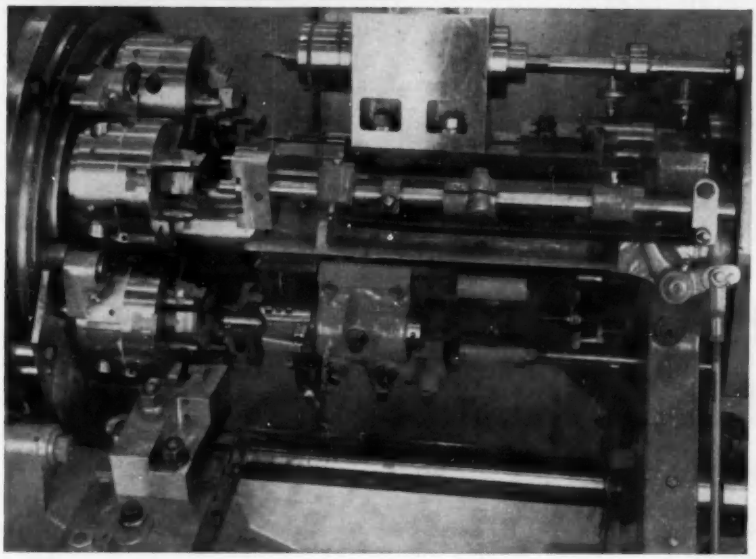
PART: Rear End Plate of Starting Motor

MATERIAL: Die-Cast Aluminum

PRODUCTION:

420 PIECES PER HOUR





OPERATIONS

Back face and chamfer one end of hub, using a recessing tool. Bore center hole concentric with flange diameters with high speed boring head. Face both sides of flange and turn the diameters concentric with hole. Bore a small hole off center with high speed boring head and tap two holes. The work is located in proper position and held stationary while the off-center hole is bored and the two holes tapped.

TOOLING...

The Baird Automatic 76H Chucking Machine is arranged for single indexing and with a recessing tool for back facing . . . high speed boring heads . . . two-spindle lead screw tapping attachment. A typical example of the endlessly varied and basically simple arrangements possible with this versatile unit.

Write Dept. AI.

THE BAIRD MACHINE COMPANY

STRATFORD CONNECTICUT

WHERE YOU WILL GET THE HELP OF SPECIALISTS ON THESE ESSENTIAL PRODUCTION PROBLEMS:

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

9BA55

Can STROMBERG—champion economy carburetor—help sell cars?

The question is directed to manufacturers whose cars are not yet equipped with Stromberg Carburetors. Car makers using Stromberg now are also using its outstanding economy record in the Mobilgas Economy Run to convince thousands of economy-minded customers.

A large segment of your market—people in every income bracket—is always motivated by economy of operation as well as style, power and other good features. Proof that the motor car industry is well aware of this fact is its participation in the Mobilgas Economy Run every year, knowing how much a victory helps new-car sales.

Stromberg-equipped cars have won the coveted Sweepstakes Award in this national economy tournament two straight years!

If economy is a touchy subject instead of a good, solid selling feature with your line of cars, it will pay you to make comparative efficiency tests with Stromberg Carburetors against the field.

Remember, for more than forty years more advances in carburetion have been initiated by Stromberg than any other manufacturer. Stromberg application engineers are at your service.

ECLIPSE MACHINE DIVISION OF BENDIX AVIATION CORPORATION

Original Equipment Sales: Elmira, N.Y. • Service Sales: South Bend, Ind.
Export Sales and Service: Bendix International Division, 205 E. 42nd Street, N.Y. 17, N.Y.

Stromberg® Carburetor Bendix® Electric Fuel Pump Bendix® Folo-Thru Starter Drive

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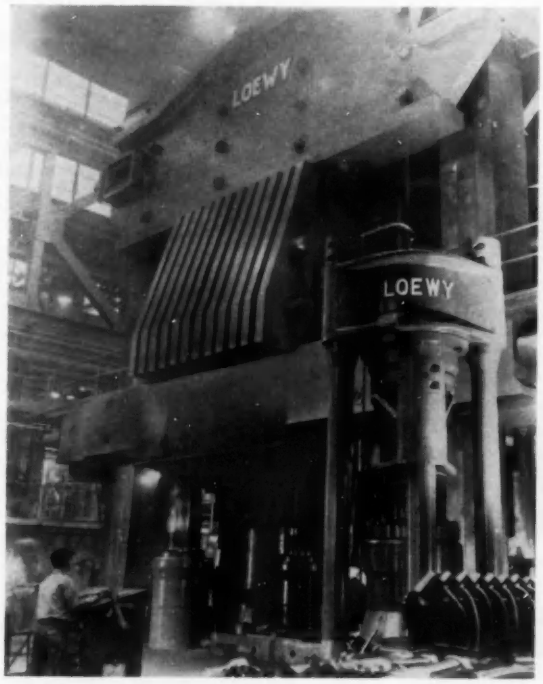
ECLIPSE
MACHINE DIVISION
ELMIRA
NEW YORK

Bendix
AVIATION CORPORATION

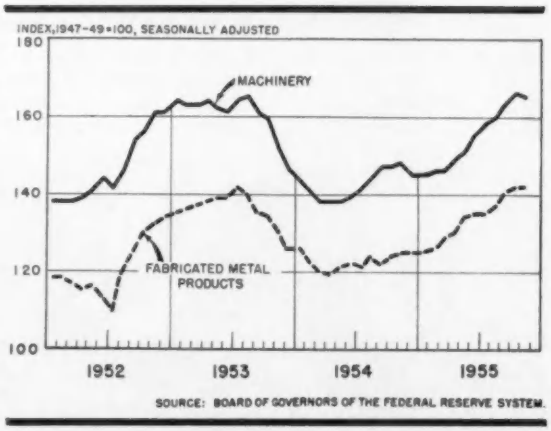
News of the MACHINERY INDUSTRIES

By Thomas Mac New

Huge Press Has Six, Three-Piece Columns, Each 110 Ft Long. Approximately 70 Per Cent of Its Total Weight of 10,750 Tons Is Designed to Move



This huge 53,000 ton capacity Loewy-Hydropress is now operating at the Wyman-Gordon plant in North Grafton, Mass.



Machinery and fabricated metal products production index

USAF's Biggest

The biggest press of the USAF program is now in operation at the Wyman-Gordon plant in North Grafton, Mass. Designed and built by Loewy-Hydropress over a five-year period, it is capable of exerting a pressure of 106 million lb. Equal in height to an 11-story building, it stands 50 ft above the operating floor and extends 60 ft below it. The giant press is suspended in a pit 100 ft deep, surrounded by walls of concrete and steel up to 17 ft in thickness. Each of the six columns is made of three identical forged steel sections, 110 ft long—the largest one-piece components ever fabricated. Each column weighs 330 tons. Of its total weight of 10,750 tons, 7500 tons move!

Around the Industry

Pratt & Whitney Co., Inc., enjoyed a record 1955 in the production and delivery of BG type Keller machines. The last of the $100,000 tracer controlled machines produced in '55 went to the Budd Co.

GE's Carboloy Department has installed a rotary gang slitter for precision cutting of high temperature alloys. The machine, developed by Stanat Mfg. Co., slits both coils and sheets in widths of eight inches and thicknesses of from 0.100 in. to 0.003 in., holding tolerances as close as plus or minus 0.001 in. Currently, the unit is working with vacuum-melted, austenitic, nickel-base, and cobalt-base alloys for gas turbines.

Pines Engineering Co. has purchased all assets and patent rights of Roto-Mation Motors, Inc., of St. Clair, Mich.; and a new corporation has been formed in Greenville, Ohio, to be known as Roto-Mation, Inc. All equipment and personnel have been moved from St. Clair to Greenville. The company will operate as a separate subsidiary of Pines. Roto-Mation produces oscillating pneumatic and hydraulic torque motors.

A streamlined production procedure has been engineered by U. S. Chemical Milling Corp. to handle large volume requirements for chemically milled parts manufactured from a process developed at North American Aviation. The new method is applicable to short runs as well as production quantities, and it is claimed that even a single part can be processed economically. Complex contoured shapes, spheres, cones, etc.; broad or narrow cuts; and comparatively sharp corners can be handled by the new process. Removal of metal on more than one side of a part at the same time is also possible. Any part which can be immersed in a liquid can be chemically milled.

United States Chemical Milling Corp. is currently doing subcontract work for major aircraft concerns, such as North American, Lockheed, Convair, Douglas, McDonnell, and Chance Vought.

Hammond Machinery Builders, Inc., Kalamazoo, Mich., has purchased the Grand Rapids line of drill and tap grinders from Gallmeyer & Livingston Co. of Grand Rapids.

NEW PRODUCTION and PLANT EQUIPMENT

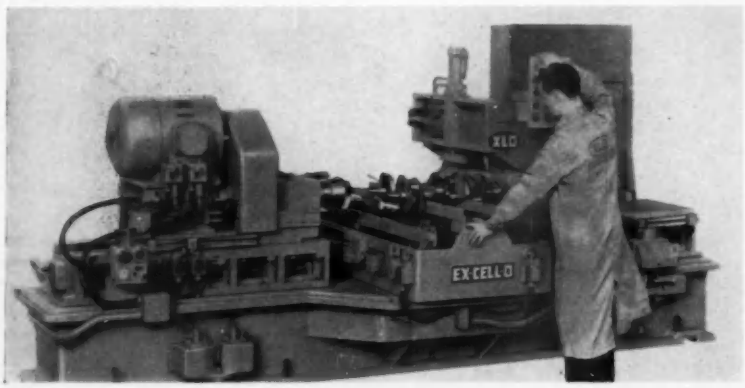
FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

Crankshaft Machine is Automated

PERFORMING triple operations simultaneously on two crankshafts a special machine is loaded and unloaded automatically. Operations on the crankshafts include finish boring a diameter within limits of ±0.0005 in., and holding the bore concentric with the main bearings; facing a surface square with the main bearings, and chamfering an edge. It uses two standard hydraulic slides mounted on a base with a fixture between them. At the beginning of each successive machine cycle, two crankshafts have been completed in the machining station while a second pair are in "ready" position. In motion, transfer bars move the finished crankshafts to an unloading device, while the others are brought into machining position. Hydraulic chucks grip the latter two crankshafts, and rotation of them begins. Non-rotating tools advance horizontally to finish bore the crankshaft ends.

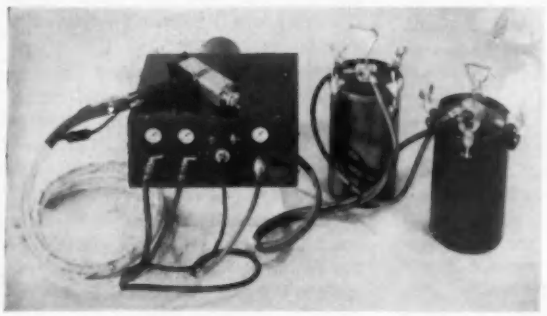
This done, facing and chamfering tools descend from above to engage the workpieces and complete the machining cycle. *Ex-Cell-O Corp.*

Circle 70 on postcard for more data



This is an application of automation in a department remote from a main automation line.

Sprays Epoxy Plastic Resins



Spray gun for plastic resins features electric heat element, special mixing nozzle, metering device. Firm announces it will soon have ready dispenser attachment. (Kish Industries, Inc.)

Circle 24 on postcard for more data

Flexible Shaft Machine

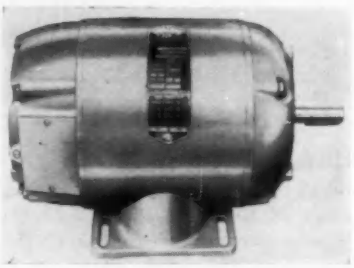
OVERHEAD type flexible shaft machine V50 has been introduced. It is designed to be hung on a swivel mount, from an overhead trolley. The ½-in. shaft will transmit up to three hp. It is belt driven at speeds up to 5750 rpm. The belt and pulleys are fully guarded and easily changed. Tools for reaming, grinding, buffing, sanding, wire brushing and drilling can be used. *Stow Manufacturing Co.*

Circle 25 on postcard for more data

Slip Ring Motors

VARIABLE speed and step-by-step starting features of slip ring motors are now available as standard units in fractional-hp ratings. The small No. 66 frame size represents an approximately two-in. reduction in both length and diameter from the previously smallest size. Slip ring motors are used on machines that require operator-regulated running speeds. An example of the motor's versatility is the starting of a heavy load on regular low line current. High starting torque is provided by starting in a slow-speed "step"—full speed being attained through a series of steps. This series is available with speed selections from 50 to 100 per cent of full load speeds in the following ratings: 1800 rpm (full load speed), ¼, ⅓, ½, ¾, 1 and 1½ hp; 1200 rpm (full load speed), ¼, ⅓, ½, ¾, and 1 hp. *Reuland Electric Co.*

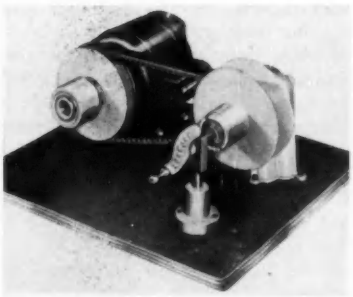
Circle 26 on postcard for more data



Reuland slip ring motor.

Aligned Drive

A COMPOUND drive variable speed pulley provides constant belt alignment through its entire speed range up to 8 to 1 ratio. Using a



Lovejoy Compound Drive is designed for installation in new equipment, or to replace less effective units now in use.

1750-rpm motor a speed range of 5550 to 690 is obtained at a rated ¾ hp. With an 1150 rpm motor a speed range of 3650 to 454 is provided at a rated ½ hp. These pulleys accommodate the new NEMA motor frame shaft sizes and use a ⅞ in. top width or A belt as standard. Available in either spring loaded or manually operated design, they can be mounted on one side or alternate sides. Manually operated units are equipped with either pedestal stand or attachment for hydraulic yoke. Features include oil-impregnated bronze bearings, parts machined overall, with sliding surfaces precision ground. Where mounted on one side, the spring loaded design measures 6½ OD by 3⅜ in. long. Mounted alternately, dimensions are 6 in. OD by 3⅞ in. long and 6 in. OD by 3⅜ in. long respectively. *Lovejoy Flexible Coupling Co.*

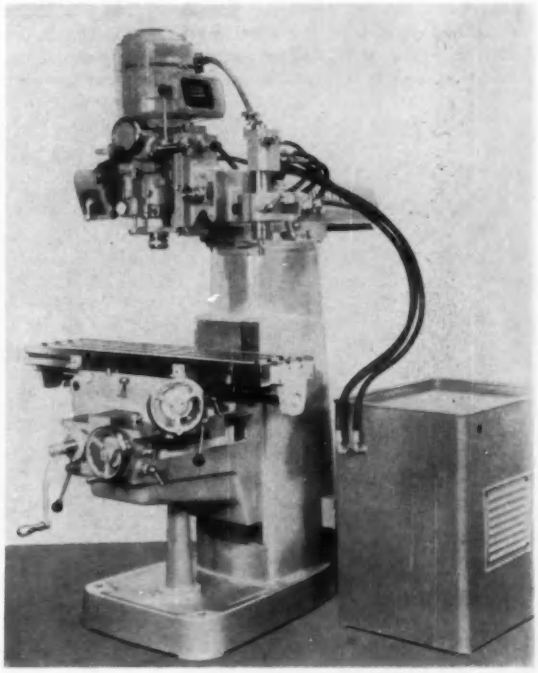
Circle 27 on postcard for more data

Winter Door

PROTECTION for workers from icy winter drafts every time factory doors are opened, is announced. A retractable curtain can shield doorways during cold weather, yet readily slide out of the way for free use of floor space. Built of a heavily coated fabric, TransWall installs easily on a single overhead track. Nylon rollers permit instant retractability. Little space is used when retracted. *Bemis Bro. Bag Co.*

Circle 28 on postcard for more data

Tool and Die Milling Machines



Contourmaster milling machines are designed for production of small contoured shapes such as molds and dies, hobs, etc. Style 1B pictured has 22-in. table travel, hydraulic depth control tracer, dual hand controls for the quill. Truncated column provides swivel mount for cross sliding ram, which has shaping attachment on rear. Attachments include automatic duplex rotary table adjustment, automatic table cycle, hand pickfeed to saddle, reverse image attachment. (Cincinnati Milling Machine Co.)

Circle 29 on postcard for more data

Flush Toggle Switch Cover

FLUSH switch covers have been specifically designed to provide simple, quick access to a toggle switch which must be submerged and protected. Flush trigger and cover are available in wide range of offsets to fit a variety of panel thicknesses.

Sealed lever toggle switches have terminal block and wire leads potted in Thickol (MIL-S-8516) to provide moisture proofing and vibration

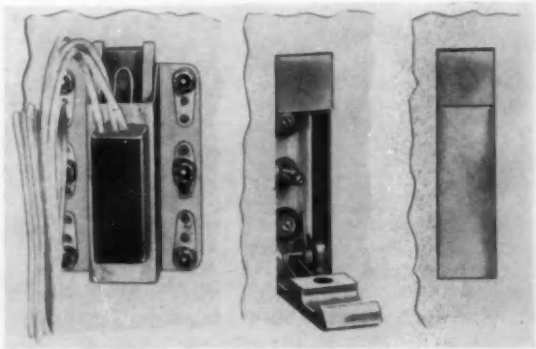


Plate and bracket mounted flush switch covers.

Simple press on trigger releases cover to open position and simple press on cover latches it in closed position. When closed the cover provides a self-contained switch guard (hole in back of latch for toggle) to prevent accidental actuation of the switch from impact or shock.

dampening. Switch itself is mounted in bracket with rubber shock-mounts to isolate switch from structure. *Hartwell Aviation Supply Co.*

Circle 30 on postcard for more data

NEW PRODUCTION and PLANT EQUIPMENT

Spray-Paint Viscosity Controller

FINISH of painted parts can be controlled continuously and automatically with the new line of controls developed for the Ultra-Viscoson electronic viscosity computer. Orange peel and buildup at the edges are claimed to be overcome.

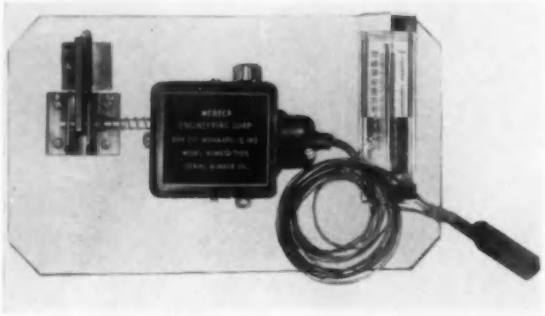
A sensing probe maintained in the paint reservoir continuously senses the viscosity and detects changes due to solvent evaporation. The reading appears on the meter, and the information is fed back to the controller. This operates an explosion-proof solenoid valve which admits solvent as required. *Cincinnati Div., Bendix Aviation Corp.*

Components of the Bendix Ultra-Viscoson.

Circle 31 on postcard for more data

Preserves Frozen Rivets

To aid in quality control of aluminum rivets, a device now available locks refrigeration when temperature within the cold chamber rises above a pre-set level. Aluminum rivets must be stored at —30 F after annealing to preserve softened condition, to prevent splitting and breaking when pressure is applied. The locking unit, a non-electrical, thermal controlled device automatically locks the freezer lid to prevent use of rivets if the temperature has risen above a critical level. The refrigerator remains locked even if temperature is lowered to normal correct operating temperature. Key retained by supervisory personnel must be inserted in lock and turned to release slidebolt and open lid. Thus, materials can neither be placed in nor removed from the freezer if the specified temperature limitation within the storage chamber has been broached in any manner. *Webber Engineering Corp.*



Locking device shown can be pre-set to operate at any temperatures from 20 F to — 50 F. Other models are available to cover higher or lower temperatures.

Circle 32 on postcard for more data

Hardness Tester

AVAILABILITY of the Mark VI Penetrascope portable metal hardness tester is announced. It is used for testing ferrous as well as non-ferrous metals of a wide range of sizes, shapes and contours. A variety of clamps including chain, magnetic and C-clamps make it possible to test specimens ranging from metal strips only 0.002-in. thick to cylinders over eight ft in diameter. Accuracy is obtained in the 16 to 800/1000 D.P.H. range (from softer than O on the Rockwell B scale to 64/69 Rockwell C), with excellent comparative results obtainable up to 1500 D.P.H. (75 Rockwell C). In operation, a 136 deg. pyramidal diamond — Vickers system — is pressed into the metal by an accurately controlled load of up to 40 kilograms. A calibrated microscope measures the indentation with an accuracy of one micron. Ball type indenters of one mm and two mm diameter are available for testing cast iron and other grained materials. *Tinius Olsen Testing Machine Co.*

Olsen Penetrascope

Circle 33 on postcard for more data

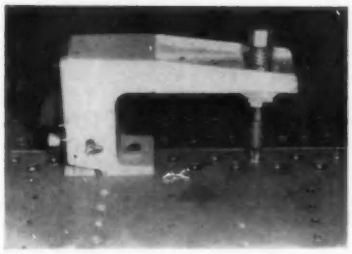
Air Operated Drills

PAR-A-MATIC air-operated drills bring advantages of automation to drilling and tapping. They consist of an air piston which advances an air motor to rotate the drill. Seven models range from 500 to 17,000 rpm. Stroke is adjustable from ⅜ to two in. in increments of 1/32 in. Operation is automatic or semi-automatic, with a remote control valve. A needle valve controls feed rate from zero up to eight ipm. The unit is designed to be built up into a special machine. *Aro Equipment Co.*

Circle 34 on postcard for more data

Screw Extractor

A NEW recessed-head screw extractor, developed by Northrop Aircraft, Inc. to lighten maintenance, is a general purpose tool designed to assist in removal of recessed-head screws that have stripped slots, frozen threads or are otherwise difficult to remove. The extractor is held in position by a single bolt screwed into the nutplate of a previously removed screw. The knurled adjustment knob at the base of the extractor is used when the tool is bolted to a convex or concave surface; the knob positions



Accessories are furnished for removing screws of different sizes, and are stowed in an integral compartment of the screw extractor.

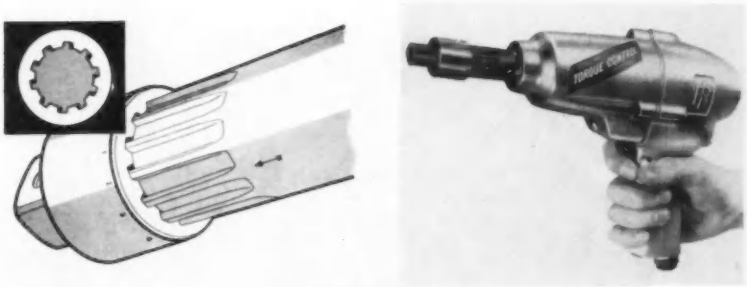
an adjustable portion of the base to provide a base area large enough to prevent skin damage during the screw extraction. *Deejl Pacific Co.*

Circle 35 on postcard for more data

Torque Controlled on Nut Runner

IT now is possible to run nuts with the great speed of an air operated impact tool, to a controlled torque. The device incorporates an application of the torsion bar principle to torque control. While the nut is being run to required torque, the new Impactool operates at normal power and speed, but when required torque is reached and nut-running resistance is equal to the stress preset in the torsion bar, the impact mechanism rebounds instantly and trips a rubber-faced shutoff valve. There is no clutch, and operation does not depend on the operator's timing.

Torque can be easily and quickly set by using a jig which turns a torsion bar and calibration collar to the desired reading, against rigid splines on the torque bar adjusting sleeve. The tool can be set to the required torque in a few seconds. Torque setting remains constant for any nut-running operation until the adjustment is changed. Releasing the trigger resets the tool automatically.



Torque Control Impactool No. 5040T, and closeup of the splined torsion bar and calibration collar.

The torque control is consistently accurate, within about 10 to 15 per cent. There is no need for pressure regulators, since the Impactool operates at full power and speed. The tool eliminates "over-torque" through the automatic shut-off. The operation is reversible with full power in either direction.

Size 5040T Torque Control Impactool has two torsion bars available. One torsion bar has a maximum torque of 60 lb-ft; the other a maximum torque of 90 lb-ft. *Ingersoll-Rand Co.*

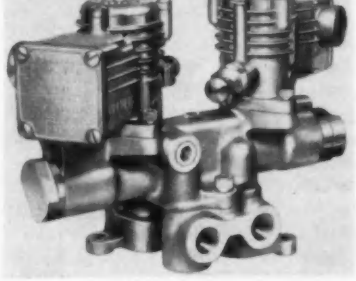
Circle 36 on postcard for more data

Air Valves

DOUBLE-SOLENOID, pilot-operated four-way valves, requiring only momentary electrical contact for operation, are capable of controlling up to 600 cycles per minute. Known as the Speed King, the valves are built to JIC standards. With pilot solenoids and valve fully enclosed, the unit is both moisture and dust-proof. Solenoid coils are completely covered with molded epoxy resin. The valve body is a machined casting of Navy M bronze and valve stem is hard chrome plated stainless steel. In production, valves are bubble-tested under water.

Pilot plungers and valve stem are are the only moving parts. There are no springs in the main valve. According to the maker, normal service life is conservatively estimated to be in excess of 20 million cycles.

Speed King valves are available in ¼, ⅜, ½, ¾ and one in. pipe sizes, with foot or sub-base type mounting. Pressure ranges in psi are: 35-200 air and 35-125 hydraulic oil for both single and double solenoid valves with internal pilot supply; 0-250 air and hydraulic oil for both single and double solenoid valves with external pilot supply; 50-125 water for single and double solenoid valves with internal pilot supply; within one in. Hg absolute vacuum for single and double solenoid valves with external pilot supply. Pilot solenoid coils for operation on either ac or dc and any voltage can be furnished. Maximum inrush current is approximately 10 watts.



Valvair Speed King double solenoid pilot-operated four-way valve, shown with manual over-ride and integral junction box

The stainless steel main valve stem floats on stationary O-ring packers. Repacking, when necessary, can be accomplished without disturbing piping. Pilots and the sub-base mounted valve body can also be replaced without removing piping.

Optional features include: manual over-ride for use during machine setup, self-contained speed control, and an integral junction box with removable cover. *Valvair Corp.*

Circle 37 on postcard for more data

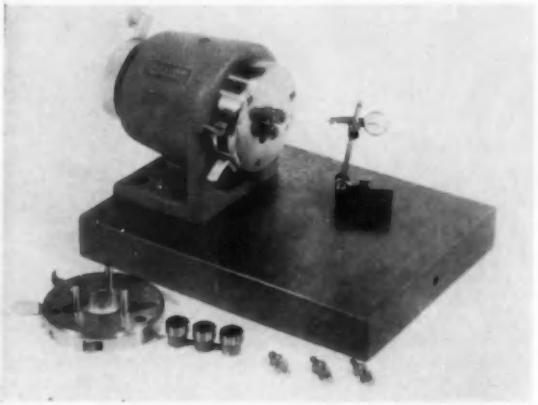
NEW PRODUCTION and PLANT EQUIPMENT

Checks Shoulder Squareness

POSITIVE means of checking shoulder squareness relative to the centerline of product threads is provided by a gaging fixture which has been announced. Described as simple to operate, this fixture is expected to find immediate and widespread application in the aviation industry and wherever extreme accuracy is required in threaded parts. Using readily interchangeable roll holding plates and interchangeable gaging rolls, the squareness thread checking fixture provides an inspection range from ¼ to 1½ in. thread diameter. Inherent accuracy is approximately 0.0002 in. total indicator reading, at 1½ in. diameter.

Used in conjunction with an ordinary dial indicator, the fixture consists basically of a gaging head mounted on a precision aligned spindle. Special ball thrust bearings insure squareness. In operation, a lever arm opens the gaging rolls carried on the gaging head. The product thread is placed on the rolls and the arm is released. The spindle and head are rotated by means of a hand crank and errors in squareness are easily read in terms of total indicator reading on the indicator dial. (This fixture is not designed to check thread concentricity.) *Pratt & Whitney Co., Inc.*

Circle 38 on postcard for more data



The squareness thread checking fixture is supplied mounted on a precision-planed surface plate, making it easy to use on a bench or at a machine.

Push Button Actuators

PUSH-BUTTON actuators for snap-action switches have been introduced. Designated the 4MA and 5MA series, they reportedly combine an attractive appearance with long life. Only a plastic push-button and a smooth clear anodized bushing are exposed above the mounting surface. Buttons of both ½-in. and one-in. diam are available in a choice of red, green or black plastic. The snap-action operation of the assembled switch and the relatively high pretravel of the actuator give an exceptionally good "feel" to the push-button switch assembly. The high pretravel also prevents accidental operation of the actuator. Many different types of basic switches can be used with the actuators, including hermetically sealed switches, high capacity switches, double-pole double-throw switches and magnetic blow-out switches. The actuator can be mounted through panels of 1/16 to ⅛-in. thickness. *Micro Switch, div. of Minneapolis-Honeywell Regulator Co.*

Circle 39 on postcard for more data

Push-button switch actuator.

Fire-Resistant Fluid

CELLULUBE series of fire-resistant synthetic oils has been expanded to include hydraulic fluids and lubricants in six controlled viscosities. Described as straight phosphate esters, they are now available in viscosity ranges of 90, 150, 220, 300, 500 and 1000 SUS seconds at 100 F. *Celanese Corp. of America.*

Circle 40 on postcard for more data

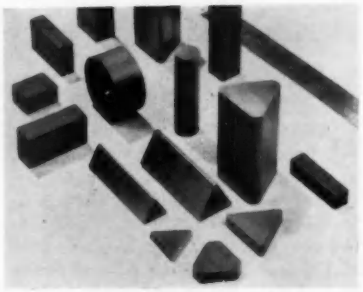
Ceramic Tools

OXIDE-BASE cutting tool material is reported to cut at up to ten times the speed and four times the length of cut before excessive edge wear, as compared to other tool materials. Stupalox will cut cast steel, cast iron, chilled iron, carbon steel, high-speed steel and non-ferrous materials. The following comparison was made under controlled conditions with all elements being equal:

Cutting Material	Speed (sfm)
Carbon steel tools	50
High speed steels (tungsten, chrome, vanadium)	100 to 125
Tungsten carbide	250-350
Stupalox	up to 2000

The manufacturer reports that in many cases it has been difficult to get exact measurements of the tools' cutting ability because of limitations of test machines and horsepower drives. The material is said to cut with no build-up on the cutting edge and no cratering adjacent to it. It is reported harder than any metallic tool, more abrasion-resistant and maintains strength at temperatures detrimental to other materials. This oxide-base cutting tool material does not generate as high heat as metallic tools, and the manufacturer claims it provides better surface finishes. *Stupakoff Div. of Carborundum Co.*

Circle 41 on postcard for more data



Stupalox ceramic tools

High-Temp Strain Gages

NEW SR-4 resistance type strain gages for use at temperatures up to 1800 F are announced. Gages are of the etched foil type, licensed and manufactured under Technograph patents. The new strain gages are offered for experimental use without guarantees and are available in kits including ten gages, four types of cement with different temperature limits, detailed instructions for use, and tools to simplify application.

Gages consist of an etched foil grid 0.0005 in. thick on a temporary carrier which is stripped off when applying them, leaving the grid embedded in a ceramic cement. Nichrome, Nichrome V, and Constantan grids are available in gage lengths of 1, ½, and ⅝ in. Temperature limits of the four cements are 700, 900, 1100, and 1800 F. Tests indicate that the gages can be used in static tests up to approximately 1100 F. Above this temperature the gages can be used only for dynamic tests. Nominal resistance of the gages is between 97 and 120 ohms. *Baldwin-Lima-Hamilton Corp.*

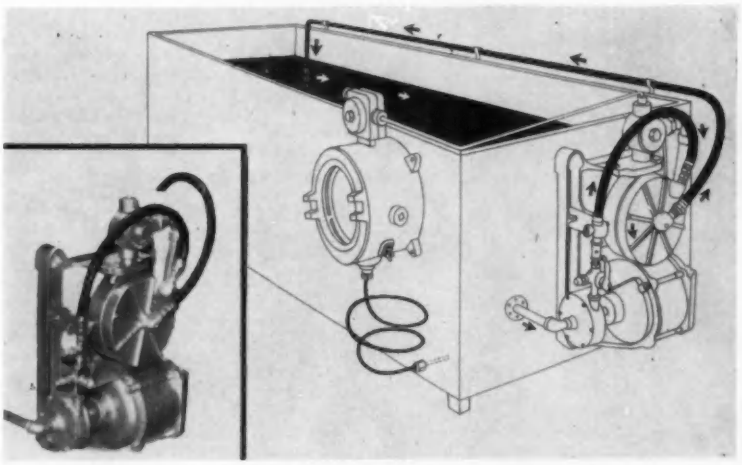
Circle 42 on postcard for more data

Localized Plating

SELECTIVE localized electroplating for engineering purposes is now available in the United States and Canada. The Dalic process has been extensively used for a number of years by many of the major aircraft manufacturers and repair depots in Europe. Applications include plating the leading edges of propellers; replating of worn plated sections on propellers; build-up and repair of worn components such as shafts, bearing races and housings; precision fitting of bearings into housings; electroplating of selected areas of electrical nitriding; spot plating for soldering; plating of identification numbers; and numerous other applications where high speed deposition is required on small areas without stopping-off or dismantling. The process utilizes a newly designed group of air and water-cooled styluses and a complete range of special non-toxic, non-fuming metallo-organic solutions. These solutions are capable of plating small areas at current densities in some cases as high as 6000 amp per sq ft. *Marlane Development Co.*

Circle 43 on postcard for more data

Controls Dip Paint Viscosity



Visco Dip for quality control maintains constant viscosity.

VISCO Dip is a recent development in viscosity control for dip tanks, used in the dipping and flow-coating art.

Daily temperature variations in dip tanks may find the viscosity too heavy in the morning and too light at midday. Attempts to control viscosity are further hampered by varying rates of solvent loss. The new controller maintains dip tank temperature within a plus or minus one deg, thus holding constant viscosity and automatically compensating for plant temperature change and paint consumption.

The device combines an explosion-proof heater and a precision liquid temperature controller. The paint is circulated out of the tank through the heater and returned into the tank beneath the liquid level. The precision controller actuates the heating unit and maintains the paint at a pre-determined temperature. The unit is available in two models, the 300 and 600 series, and is designed to control dip tanks of up to 200 and 600 gal respectively, at a selected temperature level of 70 to 100F. *Spee-Flo Co.*

Circle 44 on postcard for more data

Deep Throat Presses

FEATURING crankshaft design said to embrace numerous operating and structural improvements, a new line of deep throat presses has been introduced. Styleline series C presses are built in eight different models from 22 to 150 ton capacities, each with several throat depths. They are designed to perform a variety of blanking, forming, drawing, perforating, combination die and automatic feeding operations, in short change-over runs or high production setups.

The front-to-back crankshaft permits not only space-saving enclosed construction, but also the use of a wider slide (left to right) and longer gibbing. The entire driving mechanism is concealed within the all-steel frame. Gear and clutch members operate in sealed baths of oil.

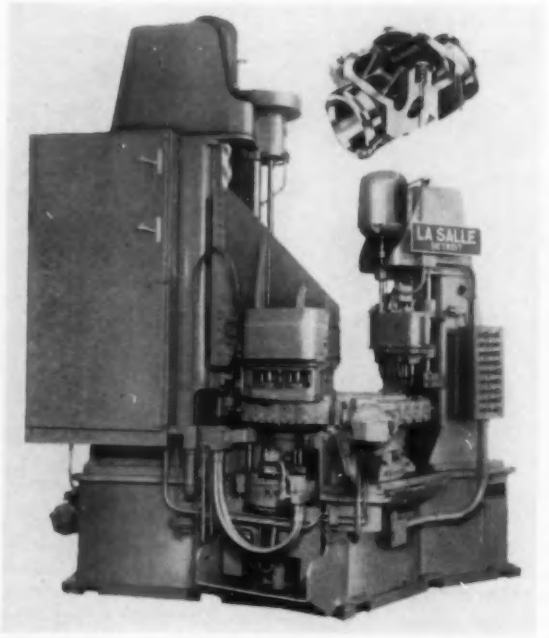
The heavy-duty steel frame is box type, with a heavy crown, deep bed and a solid bridge between the gibs forming a rigid tie between the uprights. These welded units are stress-relieved and grit blasted before machining.

Geared models are equipped with electro-pneumatic clutch in connection with an air-releasing brake. Non-geared models use the mechanical sleeve clutch and drag brake, but are also available with a pneumatic clutch trip and special air releasing brake—the latter for use with automatic feeds.

All models are equipped with the latest operating controls providing maximum protection for operator, die setter and the press itself. Foot controls and engineered feeders for automated setups are also available. *Niagara Machine & Tool Works.*

Circle 45 on postcard for more data

Processes Brake Cylinders



Handling four parts at once a five-station vertical dial-type machine produces 1028 Brake cylinders per hour at 100 per cent efficiency. Thrust motor is in front of the ways, centered on the load. Electric motors on the column drive the upper spindles through splined shafts. The lower, eight-spindle head is driven by a hydraulic motor and controlled electrically. Pot-type heads at stations 2, 3 and 4 can be replaced without removing the platen. (LaSalle Tool Inc.)

Circle 46 on postcard for more data

Level for Tooling

MICROPTIC level B131A Mark III has been designed to provide the specialized performance demanded by optical tooling. The level is designed for greatest ease in set-up and use for airframe construction and repair, machine tool assembly and erection, and for precision leveling in general industry. Its construction makes final leveling accuracy independent of the care with which the base has been leveled. Final precise leveling is done through a fine graduated screw, operating from a pivot at the instrument's center, a significant improvement over the design of similar levels with tilting pivots appreciably off center. The split precision bubble and prismatic reading system are fully protected—mounted free from strain, integral with the sighting telescope for absolute rigidity. The eyepiece is fully erecting and of new and improved design. The optical micrometer has a range of 0.250 in., reading to 0.001 in.; pointing accuracy is 0.002 in. in 100 ft. *Engis Equipment Co.*

Circle 49 on postcard for more data

Plate Cleaner

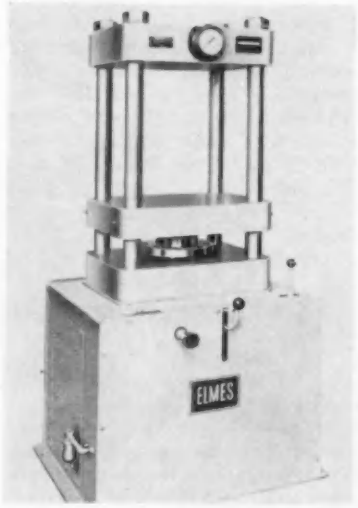
THE cathode plate scrubber is designed to clean polished metal sheets before they are plated. It removes unwanted residue resulting from the buffing of cathode plates that are to be coated in the electrolytic deposition process. The metal plates, suspended by hooks, are carried through the Cathode Plate Scrubber by an overhead monorail conveyor. A spray and cylindrical scrubbing brushes scour off residual material, and a clear water rinse follows. *Fuller Brush Co.*

Circle 47 on postcard for more data

Expanded Press Line

SMALL-PRESS users with power pressure requirements in excess of capacities formerly available in Hydrolair presses, can now obtain these production presses in 75 and 100 ton sizes as well as the previously available 30 and 50 ton sizes. All sizes are available with either hand lever or optional electric pushbutton control. The press operates from a special hydraulic intensifier, so-called Power-Petuator—being powered solely by compressed air. This device provides a continuous high-pressure stroke and maintains any preset pressure for as long as desired, without any attention from the operator. Among uses of these presses are plastics molding, rubber molding, compacting, laminating, assembly, forming, gluing, and laboratory test work. *American Steel Foundries, Elmes Engineering Div.*

Circle 48 on postcard for more data



Hydrolair 75 ton press equipped with electrical controls

Packing

COMPOUND 7402-70 has recently been approved by the Air Force for conformance to MIL-P-18017A. This specification establishes the requirements for packings used in aircraft hydraulic systems with MIL-O-5606 fluid at temperatures from −65 to +275 F. *Linear, Inc.*

Circle 50 on postcard for more data

Solid Lubricant

META-FILM, a new solid lubricant, is reported to have proven successful on iron and steel, stainless, Stellite, special heat-treat alloys, non-ferrous alloys and platings. It is said to be an extreme pressure and temperature lubricant. *American Metaseal of Detroit.*

Circle 51 on postcard for more data

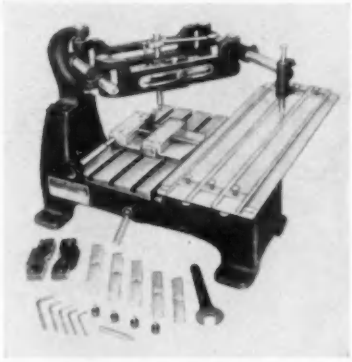
Wing X-Ray

WING stringer inspection by use of the Andrex portable x-ray unit is reduced to eight hours. Area covered is from station 421 left to 421 right. Only two men required. An estimated 1000 man-hours per year are saved by not opening and closing wings for inspection. *Holger Andreasen, Inc.*

Circle 52 on postcard for more data

Marks Hardened Parts

DIAMOND drag marking of precision parts of hardened steel, titanium and other extremely hard materials is now being accomplished. Any number of characters may be marked by the improved method without damage to parts of such high precision. Disadvantages such as rust, dangerous acid conditions, damaged work, abrasions of surface, discoloration, surface fracture and other objections to some marking methods reportedly are overcome.



Preis diamond drag engraver

The unit is equipped with an extension lever attachment which can be used on all of the maker's engravers. These pantographic machines can be furnished in bench or floor models.

In operation the precision part is clamped in the vise on the work table and the master design, master copy type or other template is placed on the copy table and followed with a tracing stylus. The diamond drag marking unit with the specially formed diamond point does not cut or remove any metal. It simply impresses a mark or design into the surface of the part in exact reproduction of the master template, reduced to any desired size ranging from 1.7 to 1 to 7 to 1 reduction from the master template. *H. P. Preis Engraving Machine Co.*

Circle 53 on postcard for more data

Clean Air Process

ULTRA-FILTRATION is the name given to a process for super cleaning atmospheric air with industrial-type air filtration equipment. The process may be used in applications formerly employing disposable or viscous filters or low voltage electrostatic precipitators. The advantages claimed include extremely high cleaning efficiency, moderate cost, and nearly complete freedom from maintenance expense.

The system employs the company's conventional industrial Dustube dust collectors of the tubular cloth filter type. It involves the charging of the filter bags with a filter aid which precoats the filtering surfaces and provides a highly efficient matrix upon which the fine particles of atmospheric dust and tarry matter are collected. One application of filter aid will last from two to three years under normal conditions. Shaking the spent filter aid and accumulated dust from the filter bags comprises the only maintenance of the filter required. *Wheelabrator Corp.*

Circle 54 on postcard for more data

Epoxy Resin

DEVELOPMENT of a new epoxy paste laminating resin, identified as Epocast 2 C, is announced. Though the filler contained is relatively small, this paste exhibits remarkable thixotropic properties, particularly its ability to cling on vertical walls and ceilings without sagging or dripping, it is said.

In application, a hardener is mixed with the paste laminating resin. This is brushed on surfaces to be protected and then glass cloth is pressed into place roughly by hand, followed in turn by a squeegee or roller applicator. Although a paste, the product rapidly penetrates and thoroughly wets the glass fabric. This new paste laminating resin is demonstrating versatility in preparing corrosion resistant surfaces on industrial structures; in laminating fiber glass jigs and fixtures; and in surfacing wood, metal and concrete storage tanks. *Furane Plastics, Inc.*

Circle 55 on postcard for more data

Static Balancer

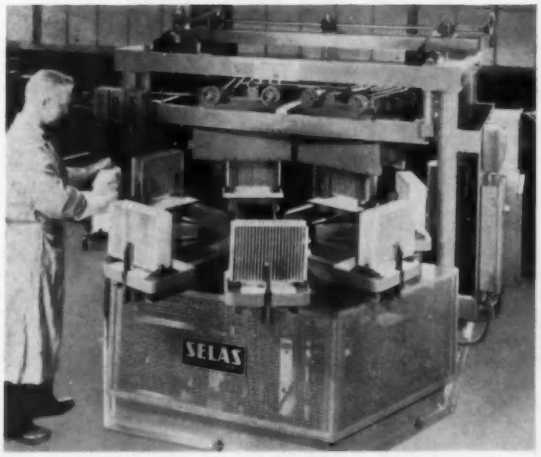
TWO vertical static balancing machines have been added to the Beko line of static and dynamic balancers. Model 201-VL has weight capacities of 1 to 20 lb and will handle diameters up to 20 in. Model 201-VH will handle 5 to 75 lb and diameters up to 20 in.

Field installations in the past two years have demonstrated their use in balancing impellers, blower wheels, flywheels, fans, pulleys and other parts having no integral shaft.

Magnitudes of unbalance are positively indicated by a large meter, calibrated directly in terms of unbalance correction procedure selected. Angular positions are pointed out by a stroboscopic lamp, and are readable either as a location to remove weight or as a location to add weight, dependent upon the users' correction procedure. *MacDell Sales Div., Balance Engineering Co.*

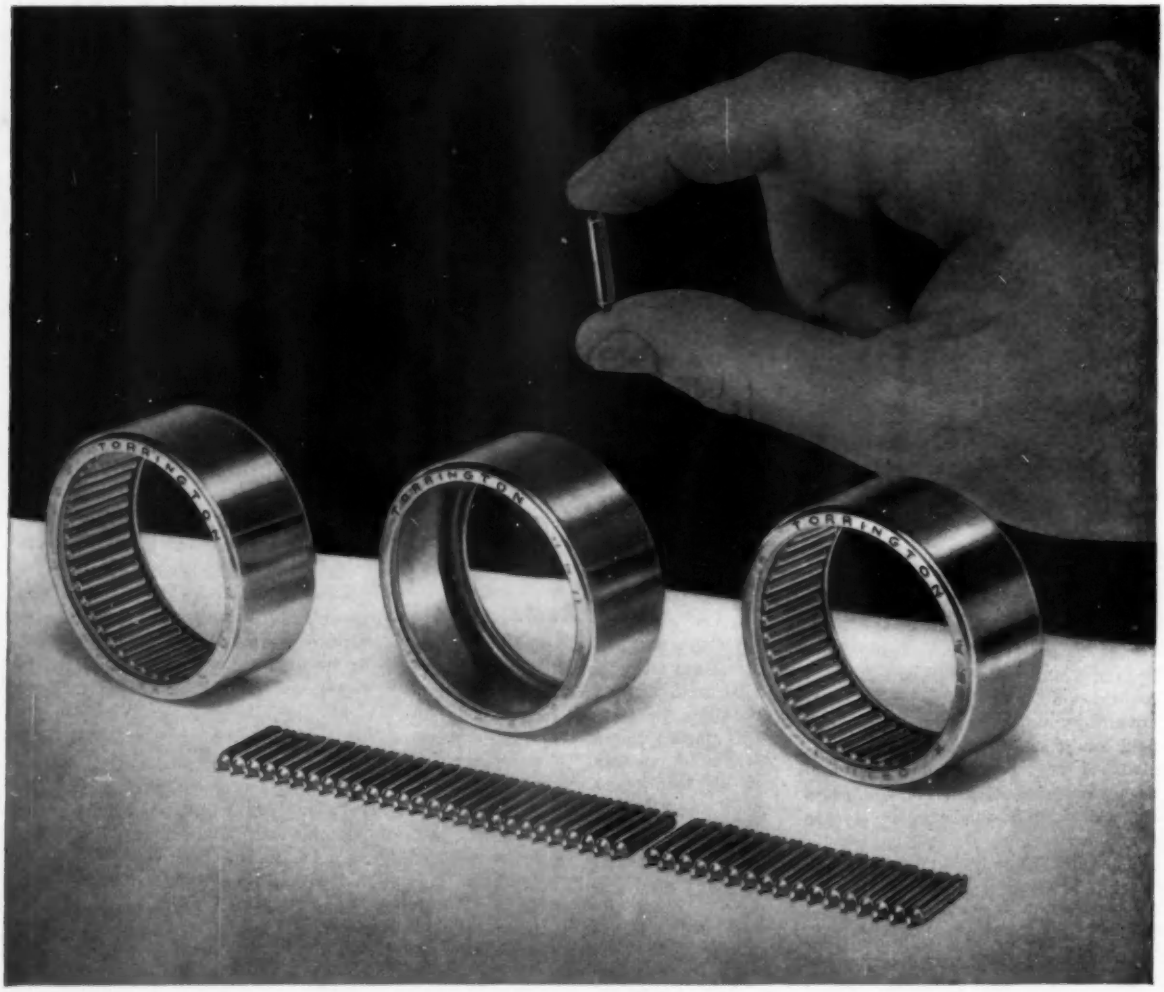
Circle 56 on postcard for more data

Production Core Brazing Machine



One manufacturer of heat exchangers is brazing all-aluminum core assemblies for automotive air conditioning on this high-speed, eight station heat processing machine. One operator can produce 50 completed assemblies per hour, (both ends brazed), at a fuel cost of ½ cent each. Flat tubes are brazed to a tube sheet at each end. Indexing dial conveyor submits each assembly to 1 min 10 sec total heating time under two specially designed Radiant ceramic gas burner units which can be raised and lowered to accommodate cores of different sizes. Fixture automatically disengages at loading-unloading. (Selas Corp. of America).

Circle 57 on postcard for more data



Here's where the **TORRINGTON NEEDLE BEARING** *gets its precision*

This Needle Roller is the "work horse" of the Torrington Needle Bearing. Its jewel-like precision is the key to smooth performance of the Needle Bearing. That's why in every manufacturing step—from alloy selection to final polishing—the rollers are checked against strict quality controls.

A full complement of Needle Rollers, mounted in a precision-made, case-hardened retaining shell, provides a maximum number of contact lines, giving the Torrington Needle Bearing a higher radial load capacity than any other bearing of comparable size.

The Torrington Needle Bearing delivers top anti-friction performance—with low coefficient of both starting and running friction.

For more than twenty years, our Engineering Department has helped designers and manufacturers throughout industry to adapt the unique advantages of the Needle Bearing to their products. Let us help you make the Needle Bearing "standard equipment" in yours.

See our new Needle Bearing Catalog in the 1956 Sweet's Product Design File —or write direct for a catalog.

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Give you these benefits

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Free INFORMATION SERVICE

Use either of these postcards for Free Literature listed below, or for more information on New Production Equipment and New Products described in this issue.

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FREE LITERATURE

Oscillo Paper 1

Lino-Writ plain and high-speed photo recording papers are fully described and priced in a technical folder, A-8258. *Du Pont Co.*

Anti-Corrosive 2

Anti-Corrosive

Chemically-resistant resins, glass-laminate, tanks, valves, fittings, fans, towers and other equipment are pictured and discussed in a new catalog. *Haveg Corp.*

Engine Hours 3

Direct reading and dial type engine hour meters are cataloged, pictured, discussed and priced in an eight-page folder. *John W. Hobbs Corp., div. of Stewart-Warner Corp.*

Reinforced Boxes 4

Facilities for engineering and producing shipping boxes of wood are displayed in a pictorial folder. *Rathborne, Hair & Ridgway Box Co.*

Keller Machine 5

Details of the larger model C Keller BL 3622 automatic tracer controlled machine are revealed in circular 588. *Pratt & Whitney Co.*

Finishing System 6

A pictorial view of many processing systems for cleaning, pickling, painting, etc., is available in catalog No. A-656. *R. C. Mahon Co.*

Hot-Cold Cabinets 7

Temperature cabinets for industrial applications cover the range from —200 to 300 F, in sizes from one to 45 cu ft. Four-page folder. *Webber Engineering Corp.*

Fixtures 8

How quick setups and easy changeovers are made to accommodate a wide variety of boring, turning and facing operations on standard precision boring machines, is pictured in bulletin No. 31255 issued by *Ex-Cell-O Corp.*

Anodized Aluminum 9

Colors for anodized aluminum that resist fading from sunlight and outdoor exposure are shown in a brochure published by *Sandoz Chemical Works, Inc.*

Furnaces 10

Furnaces for the heating and heat treatment of aluminum and other light metal alloys from the ingot to the finished product are described in general terms in bulletin SC171, which covers both batch and continuous types, including soaking pits, coil annealers, continuous process roller hearth furnaces, batch type units for heat treating, and melting, as well as investment casting. New data on extremely rapid heating with high speed convection are presented. *Surface Combustion Corp.*

(Please turn page)

VOID After April 1, 1956 **2/1/56**

Circle code numbers below for Free Literature, New Plant Equipment, or New Product Information

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
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41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
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Controllers 11

Complete information about Speedomax H electro-pneumatic controllers —current-adjusting type—is now available in a four-page data sheet, ND46-33(106), just published by *Leeds & Northrup Co.*

Hose Coupling 12

A revised 20-page catalog on its Quick-Seal line of quick connect-disconnect hose couplings has just been released by *Titeflex, Inc.*

Nickel Plating 13

A 16-page technical bulletin describes the Sulfamate nickel plating process which can produce nickel deposits with considerable variations of stress, hardness, tensile strength, elongation, ductility and electrical resistivity properties. *Hanson-Van Winkle-Munning Co.*

High Speed Presses 14

High-speed automatic presses are described in a new 28-page catalog. It discusses the problems inherent in operating a press at speeds of up to 800 strokes per minute and reveals special features, feed mechanisms, attachments and all dimensions of a complete line. *E. W. Bliss Co.*

A1 Hand Forgings 15

Minimum mechanical property guarantees for all classes of aluminum hand forgings produced at its Erie, Pa., forging plant are charted in a new folder offered by *Kaiser Aluminum & Chemical Corp.*

USE THIS POSTCARD

Stainless Fasteners 16

A 52-page stainless fastener data book includes illustrations, thread and size specifications, and availability in a variety of corrosion resistant metals of forty basic fastening devices; engineering data relating to the composition, properties, applications, and weights of stainless steels, as well as other tables. *Allmetal Screw Products Co., Inc.*

Drilling Machines 17

Hydraulic feed, vertical way-type drilling machines are given pictorial treatment in catalog No. 700. *Barnes Drill Co.*

Electric Motors 18

Design features of series 100 motors described with cutaway drawings in 16-page bulletin N-100R include smaller size, lighter, cooler running. *Howell Electric Motors Co.*

Work Gloves 19

Features of a variety of industrial work gloves are pictured in a 10-page catalog. *Jomac, Inc.*

Inspection 20

An overall discussion of various methods and uses of testing metal products is presented in a new folder, No. 148-2. *Magnaflux Corp.*

Recording Equipment 21

All 150 Series oscillographic recording systems, components and associated equipment are fully described and priced in a 16-page illustrated catalog recently published. Basic systems, in 1, 2, 4, 6 and 8-channel models, as well as the 11 currently available plug-in preamplifiers, are described in detail. *Sanborn Co.*

Plastics, Resins 22

A revised reference file of plastics and resins presents the latest information about properties and uses of these materials supplied by *Bakelite Co., a Div. of Union Carbide and Carbon Corp.*

Mobile A.C. Power 23

Its new mobile a-c power unit, MO-BIL-AC, is described in an eight-page brochure available from *Star-Kimble Motor Div., Miehle Printing Press & Mfg. Co.*

Belt Grinding

"How Abrasive-Belt Grinding Increases Production" is a 31-page booklet consisting of 46 illustrated case histories. Address requests on company letterhead, with title, to *Engelberg Huller Co., Inc., 331 W. Fayette St., Syracuse 4, N. Y.*

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61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
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COPPERWELD

Leaded Steels

The steel warehouse has long been an integral part of America's industrial distribution system. Through planned buying, the warehouse is in a position to supply "less than mill runs" and to fill orders for quick delivery on all types of steel.

Today, as a further service, most of America's steel warehouses are serving the increased demands for Copperweld Leaded Steels—the steel with "built-in productivity."

NOW AVAILABLE

THROUGH MANY

NEW

SOURCES

Write for free booklet, "Lead Treated Steels."

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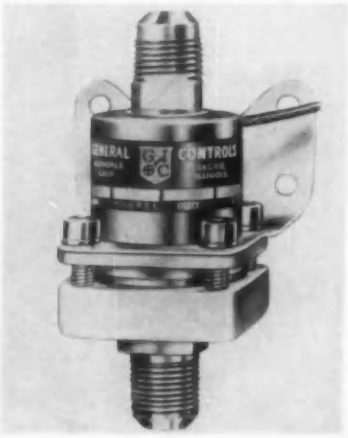
EXPORT: Copperweld Steel International Co., 117 Liberty St., New York 6, N. Y.

NEW PRODUCTS AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

For Air Conditioning

An axial-flow electromagnetic valve for control of fluid in mobile air conditioning units has been tested to provide positive action under conditions of extreme vibration and acceleration. Designated the RV-2, the new valve is compact, light weight and will operate in any position. It is packless, tight closing and is constructed of corrosion-resistant materials with a continuous-duty coil. *General Controls Co.*



Circle 60 on postcard for more data

Radio Receivers

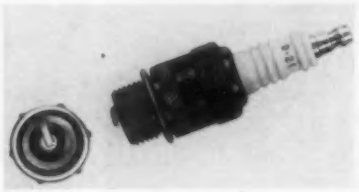
Production of subminiature AM and FM receivers is announced. The units are individually constructed as three compact modules: an R. F. assembly, I. F. assembly, and power supply, each module weighing approximately two lb with dimensions of 1 in. by 3 in. by 9 in. The three modules can be mounted as an entity or as separate units to utilize restricted or normally unusable spaces in guided missiles, aircraft, and vehicular installations. These receivers accomplish frequency monitoring of transmitted intelligence, i.e.: timing, control, voice, special instrumentation. Available in several frequency ranges from 40 to 235 mc, the receivers feature crystal frequency control, wide band frequency response, excellent sensitivity, quieting and noise rejection.

The subminiature power supply operates independently or in conjunction with the receiver. Providing B+ and filament voltages to varied equipments, its extreme light weight and sturdy, compact form minimize accommodation problems in critically balanced airborne devices. *Land-Air, Inc.*

Circle 61 on postcard for more data

For Low Speeds

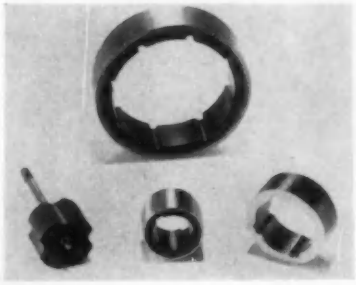
The Turbo Action D-21 18-mm spark plug is designed for low-speed or constant speed operation such as occurs in taxicabs, power units and certain farm tractors. Fouling protection is provided by extreme clearance volume at the firing end of the plug. The plug is much hotter running than that provided by similar Turbo Action plugs in passenger cars. It is installed with a regular gasket and does not use a tapered seat. *Champion Spark Plug Co.*



Circle 62 on postcard for more data

Magnets

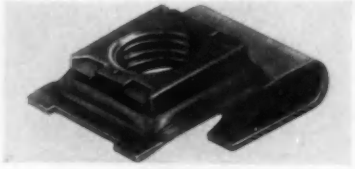
Pressed plastic bound permanent magnets are now available to American manufacturers after having been in use in Germany very successfully for a number of years. A new method of manufacture makes it possible to press shafts, temperature compensation pieces and bearings right into the magnets or to make magnets of advantageous but intricate designs on a mass production basis. Features claimed are: highest precision magnetic tolerances; lower aging requirements; where applicable cost reduction of entire magnet systems; elimination of machining. *Baermann-Nord Corp.*



Circle 63 on postcard for more data

Stake Nut

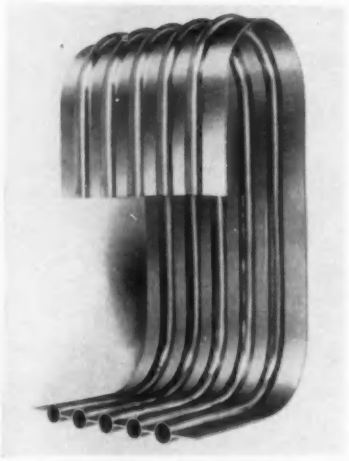
This multiple-thread stake nut fastener reportedly has many applications where vibration and heavy-duty stress and strain are prevalent. It combines ease of assembly of a clip fastener, and the security and holding power of a multiple thread nut. The lower leg is designed with a formed catch that holds the nut in position on the panel hole for ease of assembly, and acts as a lock washer when the assembly is in secure position. The panel hole size determines the amount of float desired in the stake nut. *Prestole Corp.*



Circle 64 on postcard for more data

Inflated Copper

Solid copper can be inflated into tubes by a process just announced. Tube-In-Strip is a mill product which can be made from brass and aluminum as well, for use in heat exchangers or as a structural material. Coils and sheets will be shipped flat, to be easily expanded by the customer. Presently it can be supplied in widths up to 16 in., from 0.003-in. thick and heavier stock in copper. Tube diameter or shape can be varied in a single piece. Stamping, bending, forming and drawing can be performed before inflation. The product can be bent or perforated after inflation as well and joined by normal commercial techniques.



The strip is said to start as a casting, within which dissoluble cores are used to provide the passageways. The casting is rolled into sheet with the pattern established, ready for inflation. *Revere Copper and Brass Inc.*

Circle 65 on postcard for more data

High-Temp Nut

High temperature locknuts using A286, a super alloy stainless steel, are reported to open new fastening design possibilities in jet engines and aircraft. Analysis shows the short time tensile strength of A26 at 1200 F as 105,000 psi compared to 92,000 psi for type 347 stainless. After 100 hours at 1200 F, the stress rupture strength of A286 is 64,000 psi with that of 347 at 28,500 psi. Similarly, the relaxation strength of A286 is greatly superior to 347. A wide variety of nut shapes will be manufactured from A286. On the left, Type ZL2440 is for use as a captive nut on flanged joints. The two-lug nut in the center, Type ZA1W2860, can be welded or riveted to the structure. At the right, Type Z1855, a double hex design, is for application where wrench clearance is limited. *Elastic Stop Nut Corp of America.*

Circle 66 on postcard for more data

Hotter-Cooler Plug

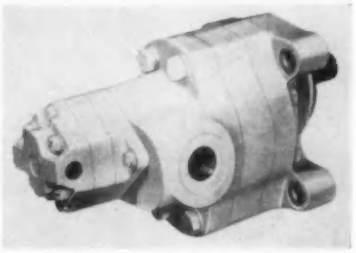
The Power Tip 14-mm spark plug for overhead-valve engines is said to run hotter at low speeds and cooler at high speeds, than does the conventional plug. To operate over a wider range of driving conditions, a protruding insulator nose brings the spark gap closer to the center of combustion. In addition to providing a longer fouling path, the design makes for easier scouring on the exhaust stroke and better cooling on intake at higher speeds. The plug is said to permit a leaner mixture and give better gas milage. *Electric Auto-Lite Co.*

Circle 67 on postcard for more data

Tandem Pump

For power steering on industrial vehicles, a tandem pump incorporating two units in one compact assembly is said to effect economies in installations where two separate hydraulic power circuits are served. Initially the larger pump may be used alone with a cover plate, later followed by addition of the smaller pump without the need of additional inlet piping.

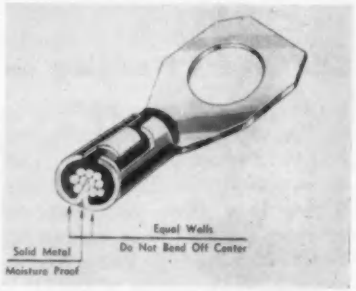
The pumps, when used in tandem, operate from a common driving medium by mating the shafts of the two pumps. A common inlet cuts the amount of hydraulic piping. Typical combinations of the tandem assembly range in length from 8 3/32 to 10⅛ in. Capacities range from 4.8 to 29.0 gpm at 1000 psi for the larger pump in 1750 rpm installations; and from 1.0 to 4.0 gpm at 1000 psi for the smaller pump. The smaller pump normally is the one used in power steering installations. *Webster Electric Co.*



Circle 68 on postcard for more data

Terminal

Development of an improved method of insulation piercing by a new design pricker-type terminal is announced. Lances are formed from solid metal to eliminate holes or openings. Increased strength of lances enables them to pierce through dead center without bending or collapsing. As the area of contact is substantially enlarged by positive full center piercing, the circuit resistance is proportionately lowered.



Produced from rich low bronze the new IP terminal withstands pull tests on tinsel wire of 15 lb or better. The method employs an improved type terminal attaching machine, with practical application of 2000 terminations per hour. IP terminals are produced in strip form and supplied on reels. *Crimpweld Corp.*

Circle 69 on postcard for more data

METALS

Slight Tapering Off in Steel Buying. Sharp Boost in Cost of Iron Ore. Zinc Price Raised by Small Amount as Demand Continues

By William F. Boericke

Steel Producers Unperturbed By Cutbacks

While steel buying from Detroit has tapered off from the frantic pace that characterized it in the final months of 1955, there is little indication that the automobile companies are going to bypass any material tonnage from their regular suppliers. It's freely admitted that costly conversion deals are out and warehouse buying has fallen off, with a few requests for deferred deliveries, but in the aggregate these amount to little.

Steel manufacturers welcome a breathing spell. It gives them a chance to fill orders from other big customers, notably the freight car builders and the construction industry whose programs have been severely handicapped because of lack of steel. Hardly a dent has been made in the freight car building backlog of 145,000 cars which was a skimpy 15,000 a year ago. Plates and structurals are still in tight supply and certain big highway programs have been held up because delivery dates for heavy structurals have been advanced six months beyond original schedules.

Consumers Hedging on Steel

The steel producers entered 1956 with a four-month backlog of orders with consumers anxious to increase depleted inventories whenever possible. Their reasoning is plausible—extra steel is like money in the bank. Higher base prices for steel are expected, probably before the July wage bargaining negotiations, certainly afterward if wages are increased as appears inevitable. Executives of the big steel companies have gone on record that a price increase across the board is justified for steel to provide a profit margin large enough to encourage investment of the enormous capital needed to expand present capacity to a minimum of 135 million tons by 1960.

Scrap Prices Advance

Steel costs are advancing. Early in January heavy melting scrap touched $53 per ton in Pittsburgh, a record high price. Soaring steel production and export demand were good reasons along with cold weather hindering scrap collections. Every $1 rise in scrap adds 50 cents per ton to the cost of steel if the ratio of steel to hot iron is 50-50. Whether the price of scrap will level off is anyone's guess as mill resistance is strong to higher prices. The Institute of Iron & Steel Scrap expects consumption in the first half of 1956 to equal that of the last six months in 1955.

Iron Ore Price Raised

Iron ore made news in January. Cleveland-Cliffs Iron Co. announced its iron ore prices for the 1956 season would be about eight per cent more than in 1955. This virtually sets the pattern for the entire industry. Prices are up about 85 cents per gross ton for all grades of ore. For 51.5 per cent natural iron content the price is $10.95 to $11.25, with open hearth lump bringing $12.95 at lower Great Lake ports. The new price boost is the sharpest since 1948 and reflects the strong demand for ore this year as well as higher mining and freight costs.

For 1956 the new weekly steel capacity figures on which the operating rate is based starting January 3 will be 2,461,893 tons, as compared with 2,413,278 tons at the start of 1955. The new annual rate is 128.4 million ingot tons, an increase of 2,534,780 tons over 1955.

Nickel Price Pointing Higher

It is scarcely news that the Government will again survey nickel supplies in the light of military requirements nor is it news that the supply is extremely tight and likely to remain so, although the world output, ex-Russia, set a new record in 1955 with an increase of 40 million lb over 1954. The dominant factor in production, International Nickel Co. of Canada, produced 65 per cent of the Free World supply.

The official price of 64½ cents per lb by the producers means very little. The grey market as well as the price paid abroad may be as much as $2.50-$3.50 per lb. Some of the smaller nickel plating firms are obliged to pay such prices for 75 per cent of their requirements. Appeals have been made to Congress for relief but Washington doesn't favor nickel allocations. A price advance is entirely possible. The last advance in Nov., 1954, was attributed to higher production costs which have advanced considerably since then. Some relief is expected from increased output from Cuba but it is some time distant.

(*Turn to page* 116, *please*)

Type "98" oil ring—U. S. patent numbers 2,635,022 and 2,695,825

DESIGNED FOR DUTY!

Perfect Circle's top compression ring was specially designed to perform where pressures are greatest, heat is highest, and lubrication poorest. The new Type "98" oil ring with self-expanding spacer assures a uniform seal against the cylinder wall plus a side sealing action on the ring groove. Both the top compression rings and the oil rings are plated with thick, solid chrome that resists wear, more than doubles the life of cylinders, pistons and rings—means thousands of extra miles of sustained power with positive oil control. Perfect Circle Corporation, Hagerstown, Indiana; The Perfect Circle Co., Ltd., Toronto, Ontario.

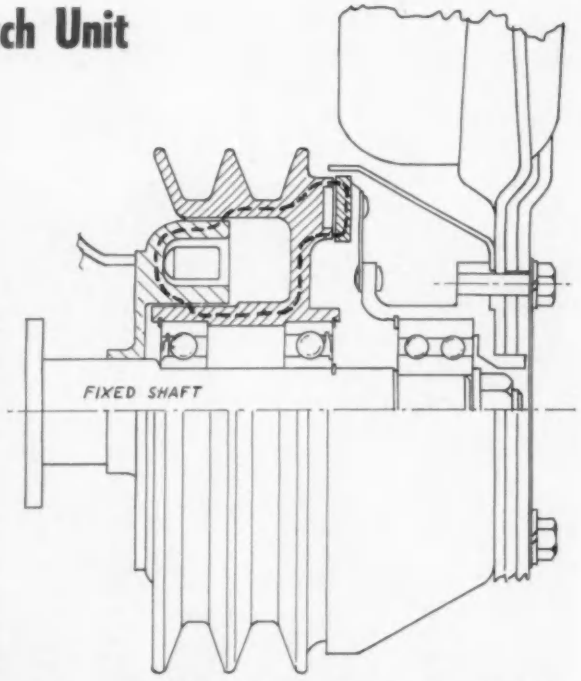
PERFECT CIRCLE

chrome piston rings

THE STANDARD OF COMPARISON

New Electro-Magnetic Fan Clutch Unit

Typical installation of the electro-magnetic fan clutch



Stationary field design for a fixed shaft in which the fan is the only unit to be driven

THE new electro-magnetic fan clutch unit made by Warner Electric Brake & Clutch Co. provides a simple, practical means to couple and uncouple the fan from its pulley. When the engine is running cool, the fan will be stopped, or it will revolve slowly from ram air through the radiator, but it does not require engine power. Whenever the engine reaches an operating temperature which demands cooling, the fan will be engaged by the clutch. It will then revolve as usual, at speeds varying with engine rpm.

Another characteristic of the fan clutch is automatic operation. The simplest and least expensive arrangement is the use of a thermostatic switch to operate an electro-magnetic clutch. The thermostat is located so it can be actuated by a change in temperature of the water system to cycle the fan clutch on and off as required.

As the horsepower race has increased in intensity, and accessories have grown in number and power requirement, fans have become larger, increasing the power drain on the engine. At high speeds, the fan may absorb 10 per cent of the horsepower, a drain which can be eliminated by automatic fan control.

There are two basic types of fan clutch units, one for engines with fan and water pump on the same shaft, driven by a common pulley, and the other type for engines with the fan separated from the water pump. This latter type is usually mounted on a fixed shaft. The Warner stationary-field clutch has been applied to both types of mountings. This stationary-field unit is unique because the coil which supplies the magnetic flux is a stationary part of the clutch assembly. This eliminates any need for collector rings or brushholders. Because the field of the clutch is stationary, it is possible to connect it directly to the power supply. A rotor revolves concentric with the field and is fastened to the driven shaft. The armature, as in the collector ring-type clutch, is fastened to the driven power source and is identical for both types of clutch. When the field is energized, the driven armature is attracted to the rotor, driving the shaft in full positive engagement.

One type of mounting has a stationary-field clutch mounted on a water pump housing. The sheave and rotor are fastened together and mounted to drive the shaft continuously. This way the water pump impeller is always rotating. A hub is mounted on bearings in front of the rotor with an armature fixed to the hub with leaf springs so it normally runs with a small clearance between its face and the rotor face.

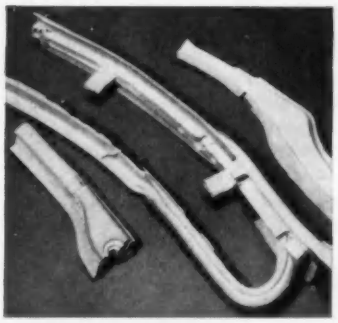
(*Turn to page* 100, *please*)

Using

DU PONT ELASTOMERS

NEOPRENE - HYPALON®

in Design



HYPALON® adds extra life to weather stripping, cable covering, spark-plug boots

Automotive designers are putting HYPALON to work at many varied tasks. One use for Du Pont's new synthetic rubber is as a protective coating for rubber weather stripping on trucks, buses and automobiles. (See photo above.) It protects the rubber stripping from deterioration by weather, sunlight and wide extremes of temperature.

Other uses for HYPALON include ignition-cable jacketing and molded spark-plug boots.

Products made of HYPALON offer extra-long life, especially under exposure to severe service conditions. They withstand temperatures from 250°F. to 350°F.; are unaffected by ozone, sunlight and weather; resist chemical attack. And HYPALON can be compounded in an unlimited range of light-stable colors.

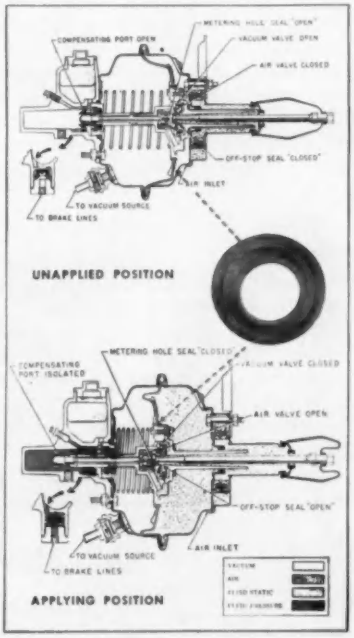
In addition, HYPALON resists oil, grease, chemicals . . . withstands abrasion and flex cracking. Why not find out how HYPALON can help you? We'll be glad to send you further information. Just clip and mail coupon.

Over 1,000,000 NEOPRENE diaphragms now used in Kelsey-Hayes power brakes

Neoprene chosen for resilience, flex and heat resistance

Before Kelsey-Hayes specified neoprene for the brake diaphragms of their power brake, they tested several materials. The material to be chosen had to withstand a minimum of 500,000 flexing cycles through a full three-inch stroke (see photos).

Ordinary rubber diaphragms couldn't take the punishment, but those made of neoprene lasted well over 1,000,000 cycles—twice the durability demanded. Kelsey-Hayes engineers also found that neoprene *retains* its resilience at temperatures ranging from -40°F. to 200°F. The end result is that neoprene diaphragms are now used in over one million Kelsey-Hayes units.



Many other automotive uses for neoprene

The unique *balanced combination of properties* offered by neoprene products has led to its use for many automotive applications. As a radiator or heater hose, it withstands the deteriorating effects of oil, grease and heat. And its resistance to weathering and sunlight provides long product life in many applications where exposure to weathering is necessary. Neoprene stands up where ordinary resilient materials fail, improves product performance, cuts replacements.

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Elastomers Division, Dept. AI-2
Wilmington 98, Delaware

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Observations

By Joseph Geschelin

Speakers' Problems

We recently completed several speaking engagements—SAE in Indianapolis and Fort Wayne. The questions asked most frequently by people in the audience were: when will we have double-disk brakes; why does the industry not build small, light cars; when will the horsepower race stop; and when will engineers take over from the stylists. It takes a lot, public relations feel, to answer some of these without getting tangled.

Parts Makers

Several years back we ran a series of articles describing the unique contributions of many of the major parts makers. Many of these important suppliers remain apprehensive as to the future course of events since their customers have a habit, on occasion, of deciding to make their own parts and accessories instead of buying them. Regardless of such events, and we may note the situation is not new, the fact remains that parts makers provide a basic service that cannot be matched by their customers. We refer to their specialization, to their employment of inventors and designers interested in special mechanism, and to their special research facilities and know-how. This writer firmly believes that the parts maker can best retain his position as a supplier to the industry by continuing to create new things and new ideas. That is his main stock in trade.

Automation Imperative

L. L. Colbert, president, Chrysler Corp., told the National Press Club some months ago that automation is the only key to productivity and maintenance of our standard of living in the future. We are approaching a period when the total population is increasing faster than the available work force. In the next ten years, for example, it has been estimated that population will increase by 20 per cent whereas the portion of the population available for factory jobs will increase by only six per cent. In the face of this eventuality, it is fallacious to intimate that automation can lead to unemployment.

Fuel Injection

More and more interest is being evinced in the development of gasoline direct fuel injection systems. We learned just recently that one of the major parts makers, not previously associated with this development, has started a large scale program. With a number of companies attacking the problem simultaneously, it is quite likely that development can be speeded and a more practical system can be made available sooner.

SAE ANNUAL MEETING

(*Continued from page* 67)

of the forging. Now with new methods at our disposal such as die quenching, draft angles reduced to one degree and even zero degrees in some cases, and larger presses with better controls we can see that the trend is toward less and less machining. The present figure at Republic shows 57 per cent of the forging remaining after machining. We hope that in the not too distant future we will return to the former figure of 70 per cent remaining after machining.

The poundage of forgings has been increasing on each new design. First, forgings definitely save weight. Secondly, the final cost of a piece machined from a forging will be from 20 to 25 per cent cheaper than an equivalent part assembled from many pieces. This coupled with the improvements in the art certainly indicate a continued trend to the use of more and more forgings.

Anti-Friction Bearing Materials for Aircraft Powerplants

By John Preston, Jerome Mogul and G. K. Floroff

Wright Aeronautical Division Curtiss-Wright Corporation

BECAUSE of the high speeds and high operating temperatures that are encountered in turbine type power plants, bearing operation has not always been trouble free. The importance of high bearing reliability has led to an intensive study by industry of the factors which affect bearing life. Besides the factors of bearing size and loading, temperature and speed, which are pertinent to a particular engine design, there is the very important factor of bearing material.

The metallurgical requirements for a successful bearing include the selection of a material which will maintain its hardness after a long time exposure at the operating temperature. The "hot hardness" (Figure 1) is the criteria which is often used to help determine the suitability of a material for races and balls or rollers. It is believed that successful operation of a bearing depends on ability of the steel to maintain a hardness of 60 R. at operating temperature.

The acceptance of this parameter indicates that the materials to be considered for bearings to operate at each of the following temperature ranges are: up to 350 F—SAE 52100

(*Turn to page* 122, *please*)

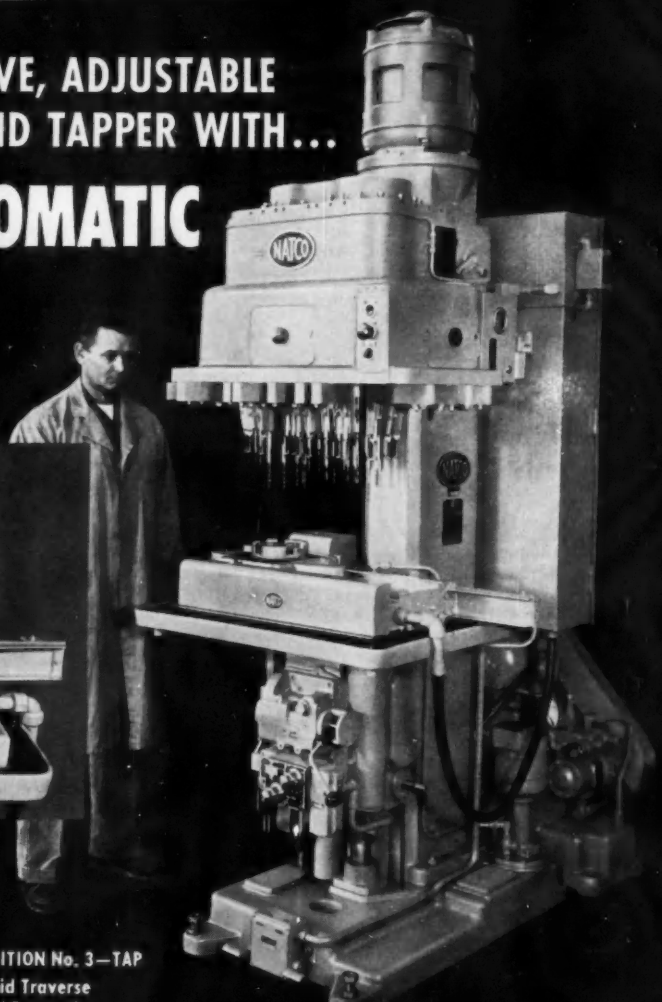
NEW NATCO DRILLER DOES WORK OF THREE MACHINES

...DRILLS, CHAMFERS AND TAPS AUTOMATICALLY!

NATCO H-6 LIGHT SENSITIVE, ADJUSTABLE MULTI-SPINDLE DRILLER AND TAPPER WITH...

3 POSITION AUTOMATIC FIXTURE SLIDE

THREE POSITION AUTOMATIC FIXTURE SLIDE IN DRILL POSITION.



TYPICAL FEED CYCLE

POSITION No. 1—DRILL	POSITION No. 2—CHAMFER	POSITION No. 3—TAP
Load Part	Rapid Traverse	Rapid Traverse
Rapid Traverse	Feed Forward	Feed Forward
Feed Forward	Rapid Reverse	Feed Reverse
Rapid Reverse	Index to Position No. 3	Rapid Reverse
Index to Position No. 2		Index to Position No. 1

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NATCO

All TABLOID

(*Continued from page 37*)

Studebaker will offer a high torque six-cylinder engine in its Transtar truck line. The 245 cu in. has a torque of 205 lb ft at 1200 rpm and will be available in the ½-ton, ¾-ton and one-ton pick-up models.

* * *

Solar Aircraft Co. has established a new 45,000 sq ft airframe parts plant at San Diego, Calif. . . . Globe-Union, Inc., will locate a new storage battery manufacturing plant at Louisville, Kentucky.

* * *

Republic Aviation Corp. has developed a method of using a thin plastic film, stretched over a master pattern, as an effective parting agent during casting or laminating of plastic tools.

* * *

National Research Council has announced development of a $3 calcium-alloy slug that it claims will enable cars to travel 20,000 miles without an oil change. The slug is placed in a special fitting in the oil line near the filter.

* * *

Crucible Steel Co. of America has announced that it will install a new $2.5 million mill for cold-rolling stainless steel and titanium strip.

* * *

Goodyear Tire & Rubber Co. is bringing out a new low price line of tubeless tires for small trucks.

Electric Auto - Lite Co.—Raymond G. Bennett was named administrative chief engineer.

Chrysler Corp. — Richard E. Forbes is now director of advertising and sales promotion.

MEN *in the* NEWS

(*Continued from page 41*)

Chrysler Corp., Engineering Div.—The following were named to the new Engineering Executive Committee: **Harry E. Chesebrough**, product planning; **Clifford B. Doty**, body engineering; **Virgil M. Exner**, director of styling; **George J. Huebner, Jr.**, research; **Ernest P. Lamb**, administration; **Alan G. Loofbourrow**, chassis, electrical, and truck engineering; **Karl Pfeiffer**, laboratories and vehicle testing; and **H. Richard Steding**, management planning. **William J. Tate** has been appointed controller.

Pittsburgh Plate Glass Co.—**Marvin W. Marshall** has been appointed director of automotive sales.

General Electric Co.—**Gerald A. Hoyte** has meen made manager of marketing for the Special Defense Projects Dept.

Doehler-Jarvis Div., National Lead Co.—**Alfred F. Bauer** is now assistant general manager.

SHORTIES

By the year 2000, nearly all the power used in transportation in agriculture is expected to be derived from internal combustion engines burning petroleum fuels.

•

In the time of our grandfathers, 210 hours were needed to produce as much as a workman does today in 40 hours.

•

According to one estimate, it appears that by 1958, it will take a fuel of about 95 octane to get top performance out of 90 per cent of the cars on the road.

Electro-Magnetic Fan Clutch

(*Continued from page 96*)

The fan is bolted to the front of the hub. When the coil is energized, magnetic pull at the rotor pole faces attracts the armature and holds it to the rotating rotor. The hub and fan are then driven with the pulley.

Another arrangement (illustrated) has a stationary-field designed unit for a fixed shaft in which the fan is the only thing to be driven, the water pump being located elsewhere. The rotor and pulley assembly is mounted on one bearing and the armature and hub assembly on another. Magnetic path is illustrated by the dashed line.

NOVEMBER STANDS IN SHADOW OF OCTOBER BUT 11 MONTHS WAY UP OVER 1954

Regional Sales of New Passenger Cars

Zone	Region	November 1955	October 1955	November 1954	Eleven Months 1955	Eleven Months 1954	Per Cent Change: Nov. over October	Per Cent Change: Nov. over Nov. 1954	Per Cent Change: Eleven Months 1955 over 1954
1	New England	24,747	29,742	21,362	360,865	297,984	−16.79	+15.85	+21.10
2	Middle Atlantic	93,997	109,582	66,226	1,242,120	948,390	−14.22	+41.93	+30.97
3	South Atlantic	62,932	70,457	46,578	809,663	570,786	−10.66	+35.11	+39.65
4	East North Central	122,296	138,450	90,960	1,643,300	1,232,185	−11.67	+34.45	+33.36
5	East South Central	30,244	32,327	19,743	331,756	245,474	− 6.44	+53.19	+35.15
6	West North Central	43,278	52,424	37,149	571,562	482,749	−17.45	+16.50	+18.40
7	West South Central	51,916	55,693	43,306	610,308	481,119	− 6.78	+19.89	+26.85
8	Mountain	18,011	19,201	12,440	212,823	153,060	− 6.20	+44.78	+39.05
9	Pacific	61,732	68,169	43,315	782,647	464,608	− 9.44	+42.52	+57.37
	Location Not Determinable	.....	.....	.....	.....	1,782	.....	.....	.....
	Total—United States	509,155	576,045	381,081	6,545,054	4,907,137	−11.61	+33.61	+33.38

States comprising the various regions are: Zone 1—Conn., Me., Mass., N. H., R. I., Vt. Zone 2—N. J., N. Y., Pa. Zone 3—Del., D. of C., Fla., Ga., Md., N. C., S. C., Va., W. Va. Zone 4—Ill., Ind., Mich., Ohio, Wis. Zone 5—Ala., Ky., Miss., Tenn. Zone 6—Iowa, Kan., Minn., Mo., Neb., N. D., S. D. Zone 7—Ark., La., Okla., Tex. Zone 8—Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo. Zone 9—Cal., Ore., Wash.

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ELECTRONIC CONTROLS

in Conjunction with Dynamatic Eddy-Current Drives, Couplings, and Brakes, Provide Automatic Speed Control for a Wide Range of Industrial Applications

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Here's the story of Dynamatic electronic controls and their application to Dynamatic rotating equipment. Generously illustrated with numerous circuit diagrams. Contains valuable service hints. It's free—just ask for Dynamatic Bulletin EC-1.

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MANUFACTURING COMPANY
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PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

Air Assist Control

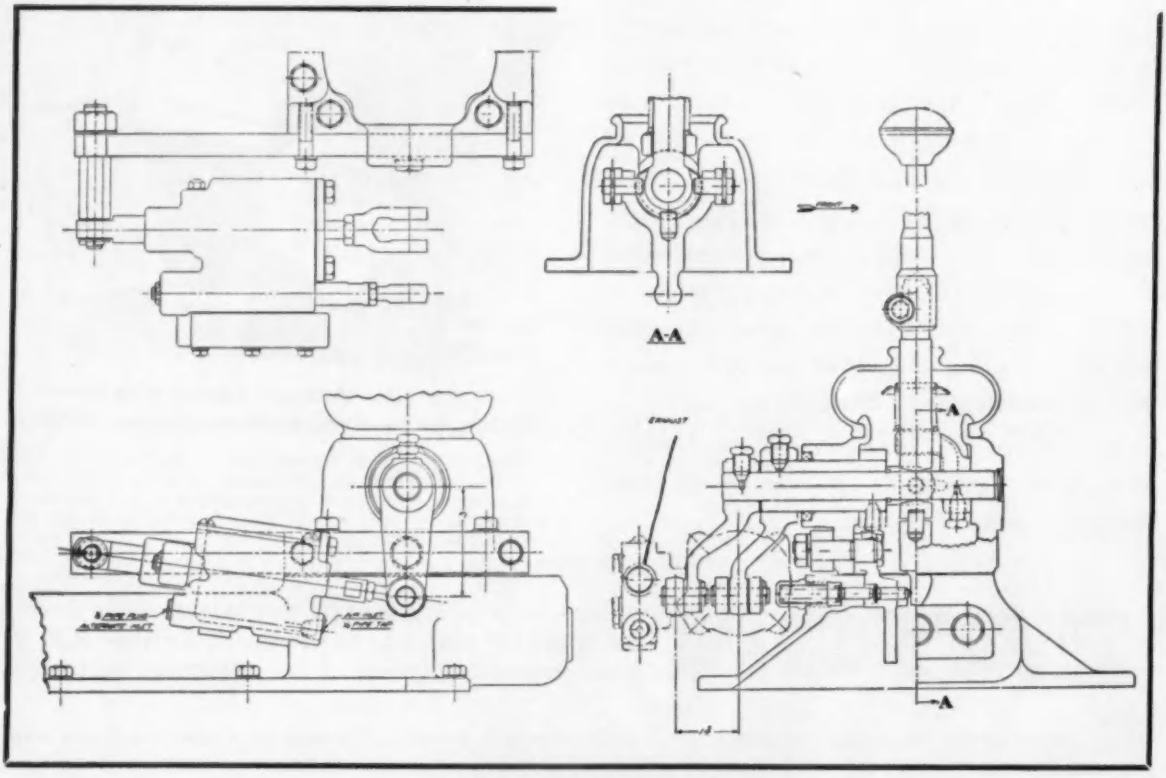
for

Spicer 6000 Series Transmission

Series 6000 transmission with air assist mounted on cover

AN air assist control for its line of 6000 Series synchronized transmissions was announced recently by the Dana Corp., Toledo, Ohio. One of its important features is that it can be readily installed in place of the standard tower control, thus effecting complete interchangeability.

With the air assist control, the operator requires an effort of only five pounds on the gear shift lever to effect a shift. The air assist, in turn, builds up to 450 lb of force to actuate the shift fork. Without air assist, the operator normally would exert up to 50 lb of effort on the gear shift lever. Thus the device reduces manual effort materially, reduces fatigue, and provides for faster and more precise gear shifting.



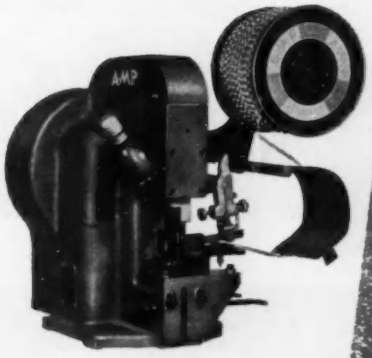
Details of the Spicer air assist

BUTTON CONTACTS NOW A-MP AUTOMATED FOR LESS COST— MORE RELIABILITY

Another new product, A-MP Automated to reduce cost! This new solderless Button Contact especially designed for automotive and appliance light sockets is made in strip terminal form and supplied on reels for automatic machine application. High speed automated terminations assure uniform high quality and cost savings.

This advanced A-MP Button Contact design provides the following features:

- **Adequate clearance, where space is limited, for twin contact application.**
- **Chamfered edges to permit easy rotation of bulb when locking into twin contact socket.**
- **Special tapered section to secure this Button Contact in phenolic insulating washer.**
- **A-MP's patented Keystone Serrated solderless crimp provides the ultimate in electrical and mechanical performance.**
- **Available for wire sizes 18 thru 14 AWG, in plain brass, tin plated or silver plated finish.**



Send today for your copy of our brochure AMP's Creative Approach to Better Wiring.

AMP

AIRCRAFT-MARINE PRODUCTS, INC.
General Office Harrisburg, Pennsylvania
In Canada: AIRCRAFT-MARINE PRODUCTS OF CANADA, LTD., 1764 Avenue Road, Toronto 12, Ontario, Canada

NEW VEHICLES
From
COMMUNIST COUNTRIES

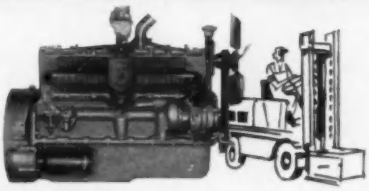
Czechoslovak Skoda 440 with all-independent suspension has a tubular backbone containing the propeller shaft. The Y-form swing axle housings are pressed in two pieces and welded along their seams. Their inside forked ends are joined to the differential housing by pivot bearings. Suspension is by a transverse leaf spring bolted to the rigid casing, and telescopic shock absorbers. Welded to the forward end of the central tube is a forked cradle carrying the four-cylinder, ohv engine of 65 cu in. which develops 42 hp at 4500 rpm. Production of the Skoda 440 is now starting at Mlada Boleslav, near Prague.

Poland's Syrena is soon to go into production as the first locally-designed car built in that country. It has a two-cylinder, two-stroke engine rated at 27 hp.

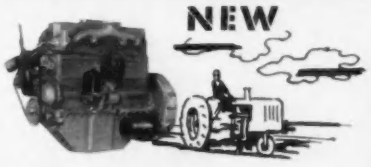
East Germany's new P70 Zwickau features an all-plastic body. The material, called Duroplast, is stated to be unusually flexible and light, and to have good heat and sound insulation properties. The two-cylinder engine of 22 hp is mounted transversely ahead of the axle and radiator, and drives the front wheels. The P70 is made at the nationalized Audi factory.

NOW . . . all types of engines

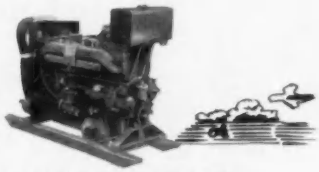
from one dependable source



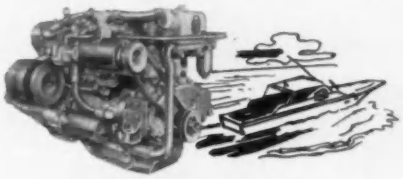
L-HEAD GASOLINE — Compact and especially adaptable for installations where space is limited.



DD-SERIES — Direct injection Diesel. 12 models INTERCHANGEABLE with GO-Series gasoline engines.



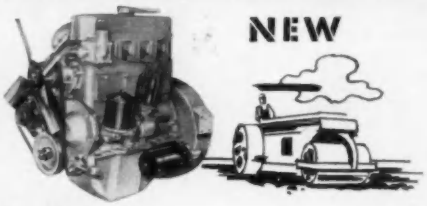
L.P.G. NATURAL GAS or KEROSENE engines are available in 40 models also popular sizes for irrigation service.



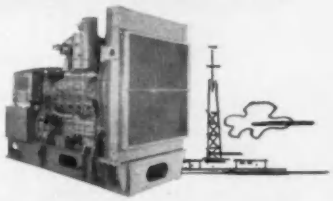
MARINE DIESEL ENGINES — Sizes from 75 to 500 H.P. for workboats and pleasure craft.

PRODUCTS OF

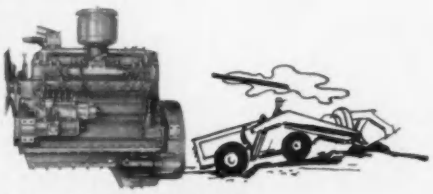
HERCULES engine manufacturing specialists



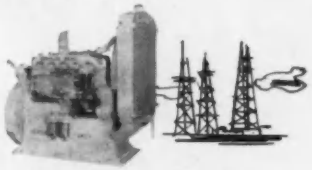
GO-SERIES — Gasoline Overhead valve engines. Available in 12 models.



SUPERCHARGED DIESELS — Maximum power for special installations such as micro-wave generator sets for coast-to-coast T.V.



TURBULENCE CHAMBER DIESELS — 32 models to 500 H.P. in 1, 2, 4, 6 and 8 cylinders.



POWER UNITS — Open, closed or base type units are available in most models of gasoline and diesel engines.

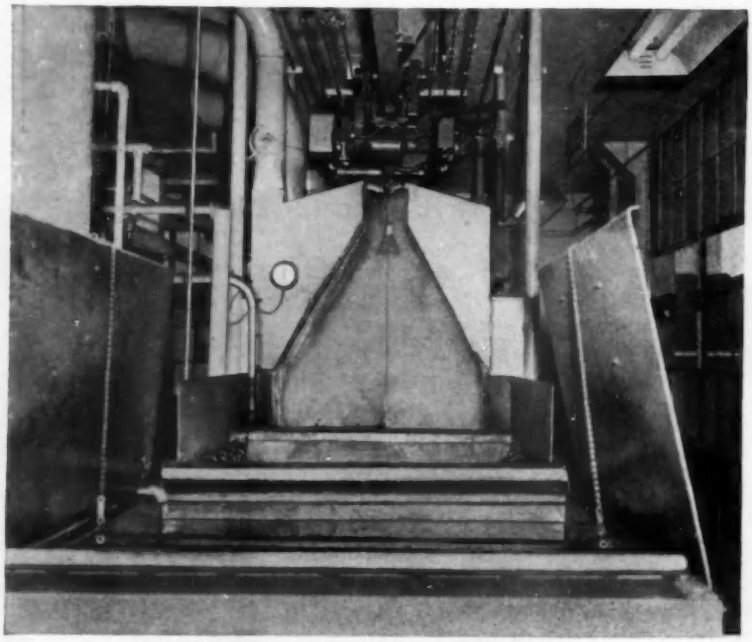
NOW . . . with the addition of the G O series (Gasoline Overhead valve) and the D D series (Direct injection Diesels), Hercules Motors Corporation offers a most extensive line of piston type engine to meet the varied needs of modern industry.

In addition to the many types of engines illustrated above, it is the policy of Hercules Motors Corporation to tailor engines to the special requirements of their manufacturing customers. Special versions of regular models — for example, "pancake" or flat engines — are often produced for particular applications.

Whatever your power requirements may be, HERCULES — Engine Manufacturing Specialists Since 1915 — will be happy to work with you and solve your power problems. For more information on the new G O and D D series — or any type of Hercules Engine from 3 to 500 H.P. contact the factory.

HERCULES MOTORS CORPORATION

CANTON 2, OHIO



Work carrier in Thermoil-Granodine® tank.

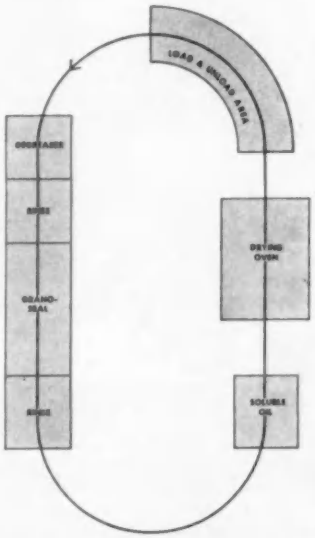
THERMOIL-GRANODINE® MINIMIZES GALLING ON SEALED POWER PISTON RING SETS

Iron manganese phosphate coating also lengthens life, combats scuffing and cylinder scoring, speeds seating

Sealed Power Corporation has licked the problem of friction welding, galling and scoring by coating its piston ring sets with Thermoil-Granodine. This inexpensive and practical method of preventing metal-to-metal contact reduces galling, cuts wear by giving rings an iron manganese phosphate surface. Also it lengthens life, combats scuffing and scoring, and speeds the normal seating time of piston rings. It is corrosion-resistant and rustproof.

These advantages are largely due to the lubricant-adsorbing characteristics of the Thermoil-Granodine surface. But they are also explained by the fact of an etching effect of the solution which produces a porous surface under the coating and leaves minute oil reservoirs in the metal when all traces of the coating have disappeared.

Write us for more information about the Thermoil-Granodine process for protecting friction surfaces, and the services offered by ACP in making it work for you—without obligation.



Process line designed and originated by Sealed Power engineers with the cooperation of ACP men for the processing of pistons, piston rings, cylinder sleeves, and thrust plates. The oval set-up permits loading and unloading at the same position—at one end of the machine.

AMERICAN CHEMICAL PAINT COMPANY, Ambler 24, Pa.

DETROIT, MICHIGAN • NILES, CALIFORNIA • WINDSOR, ONTARIO

CHEMICALS ACP PROCESSES

Almost 1.5 million metalworking industry employees are to get wage increases averaging at least 6¢ per hour this year under contracts previously negotiated with management.

Industrial versatility is the indispensable element in the barrier that the Air Force is constructing against aerial aggression. Key to success is a flexible network of suppliers.

Total U. S. industry requirements for nickel will approximate 300 million lb. in 1956, including defense requirements, according to a review report issued by the Business and Defense Services Administration.

America's long-range air attack potential is to reach a new peak during 1958. Number of Air Force B-52 heavy bombers then in service is to total about 500.

Air Force generals are pressuring for a big increase in research funds. They say the U. S. is in danger of losing the race for technical superiority in the air to the Russians.

Spending for new construction last year reached a massive $42.2 billion. This figure was 12 per cent above the previous year even after adjustments for price increases.

Government spending is to grow by a plump $2 billion in the new fiscal year. Outlays currently are running at the rate of about $64 billion.

Commercial jet transport planes may be operating from as many as 150 U. S. cities by 1965, Government and airlines officials are told. First U. S. jets are to be put into commercial service late in 1958 or during 1959.

XIII

This is the thirteenth of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

Manganese in Alloy Steels

A common and economical alloying agent, manganese is both highly respected and highly essential. It is one of the most basic elements in alloy and carbon steels; in fact, all analyses contain manganese to some extent. Whenever the content exceeds 1.65 pct, manganese steels are classed as alloy steels.

Manganese is one of the energetic deoxidizers, and has less tendency to segregate within the ingot than most other common elements. It is quite beneficial to surface quality in all carbon ranges and minimizes "red shortness" or susceptibility to tearing and cracking at rolling temperatures.

Manganese contributes markedly to strength and hardness, but to a lesser degree than carbon. Actually, the effectiveness of manganese in this respect depends largely upon the carbon content, for higher-carbon steels are more affected by manganese than are the lower-carbon steels.

Another function of manganese is to decrease the minimum — or critical — cooling rate. In this connection it enhances the hardenability. As might be expected, high manganese content with increasing carbon has a tendency to lower ductility and weldability.

Fine-grained manganese steels attain unusual toughness and strength. Such steels are often used in the making of gears, spline shafts, automobile axles, steam valves, rifle barrels, cylinders for compressed gas, and many other products. With a moderate amount of vanadium added, manganese alloy steels are also used for forgings too large to be liquid-quenched properly.

As mentioned earlier, manganese is one of the most fundamental constituents of steel. If you would care to know more about its properties, applications, and effects in alloy combinations, Bethlehem technicians will be glad to work closely with you. The same holds true, of course, when your problem involves other elements of alloy steel.

And when you require new supplies of steel, remember that Bethlehem manufactures the entire range of AISI standard alloy grades, as well as special-analysis steels and all carbon grades. You can place complete confidence in their quality.

If you would like to have a reprint of this advertisement, or of the entire series from I through XIII, please write to us, addressing your request to Publications Dept., Bethlehem Steel Company, Bethlehem, Pa.

BETHLEHEM STEEL COMPANY

BETHLEHEM, PA.

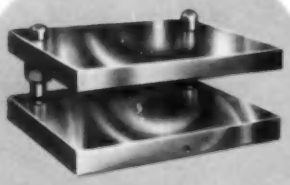
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

...see it all at the ASTE Show next month in Chicago!

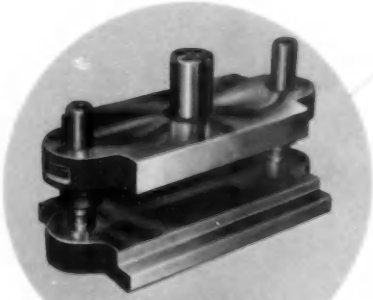
Large Standard Die Set with Semi-Steel Punch Holder and All-Steel Die Holder. New clamping method shown.



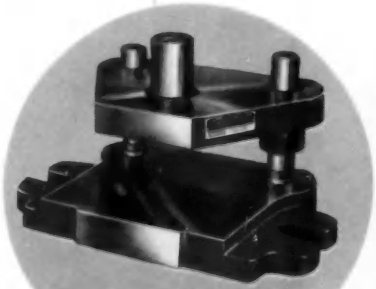
Large Precision All-Steel Die Set with clamping holes shown

ALL-NEW DANLY

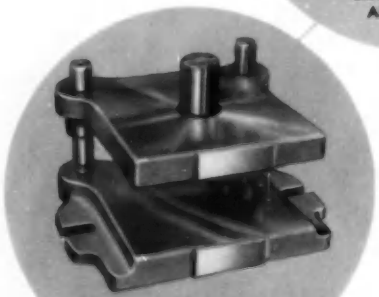
new dimensional standards... new longer life... new features...



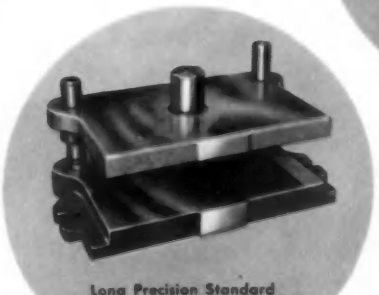
Center Post Precision All-Steel Die Set



V-Punch Holder Precision All-Steel Die Set

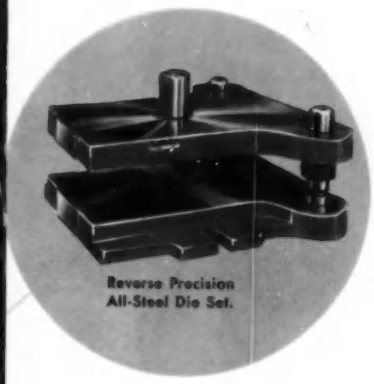


Back Post Precision Semi-Steel Die Set



Long Precision Standard Combination Die Set

8 Reasons Why Danly Leads The Die-Set Field!


Reverse Precision All-Steel Die Set.

1 Precision chrome plated MICROME guide posts wear longer and are now standard on all Danly Precision Die Sets.

2 Demountable bushings for exceptional degree of accuracy and ease of replacement are available.

3 New oil lubrication system for guide posts and bushings further protects bushings and posts from wear.

4 A complete new line of long and short shoulder Precision bushings of hardened steel . . . long shoulder types also available in hard bronze.

5 Easier faster clamping with Danly All-Steel Die Sets—clamping holes used where left to right dimension is 20" or more.

6 Removal of punch holder made easier. This feature assures easy assembly and disassembly during die making, die setting or regrinding.

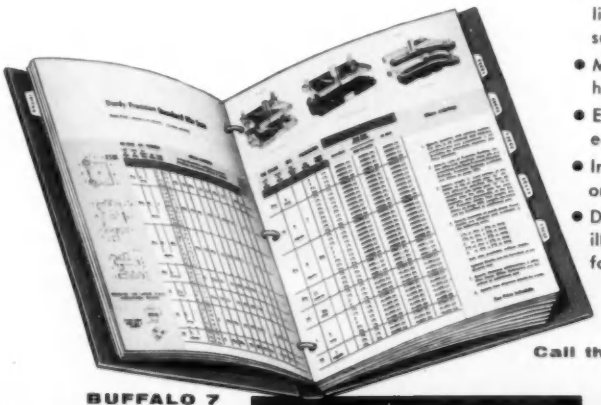
7 Danly meets or exceeds ASA Standards . . . offers many sizes not listed by ASA for a more complete selection.

8 All horizontal surfaces are ground to assure a flat, true working surface.

"LEADERSHIP LINE"

. . introduced in this all new Danly catalog

more than 200 pages of technical information



- The most complete description and listing of die sets and diemakers' supplies available.
- Many new items helpful to diemakers have been added.
- Every page designed and tested for easiest possible selection.
- Included price book simplifies ordering.
- Detailed drawings and photographic illustrations provide handy reference for designers and buyers.

Call the Danly Branch Nearest You . . .

BUFFALO 7
1807 Elmwood Avenue

CHICAGO 50
2100 S. Laramie Avenue

CLEVELAND 14
1550 East 33rd Street

DAYTON 7
3196 Delphos Avenue

DETROIT 16
1548 Temple Avenue

GRAND RAPIDS 2
113 Michigan Street, N. W.

INDIANAPOLIS 4
5 West 10th Street

DANLY

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue
Chicago 50, Illinois

LONG ISLAND CITY 1
47-28 37th Street

LOS ANGELES 54
Ducommun Metals & Supply Co.
4806 South Alameda

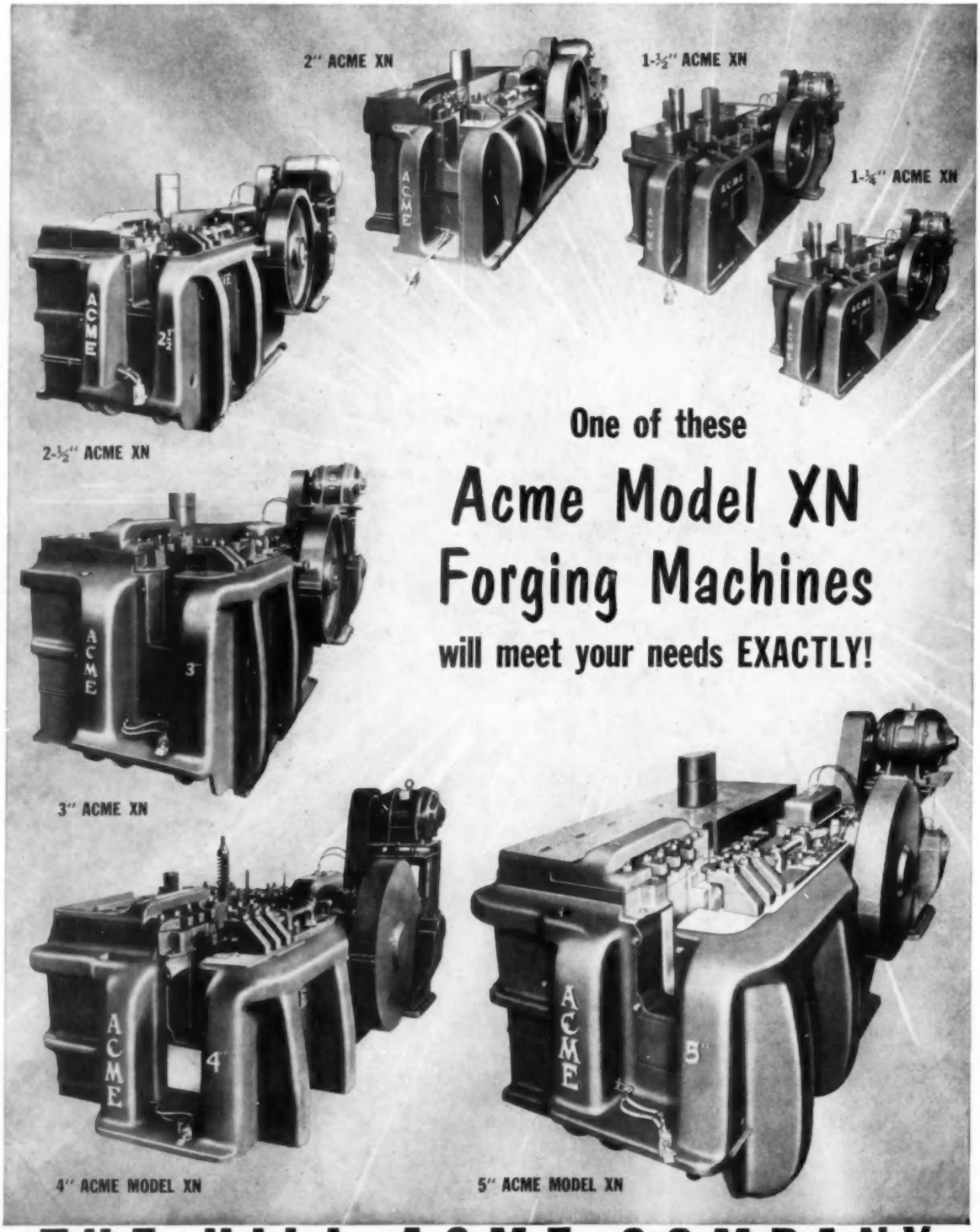
MILWAUKEE 3
161 W. Wisconsin Avenue

PHILADELPHIA 40
511 W. Courtland Street

ROCHESTER 6
33 Rutter Street

ST. LOUIS 8
3740 Washington Blvd.

SYRACUSE 4
2005 West Genesee Street


2" ACME XN
1-½" ACME XN
1-¼" ACME XN
2-½" ACME XN
One of these
Acme Model XN
Forging Machines
will meet your needs EXACTLY!
3" ACME XN
4" ACME MODEL XN
5" ACME MODEL XN
THE HILL ACME COMPANY
ACME MACHINERY DIVISION • 1209 W. 65th St., Cleveland 2, Ohio
ESTABLISHED 1892
"ACME" FORGING • THREADING • TAPPING MACHINES • ALSO MANUFACTURERS OF "HILL" GRINDING AND POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES • SHEAR BLADES

Chevrolet Six-Speed Automatic Transmission

(*Continued from page* 59)

use of the braking system. The Powermatic offers power take-off openings — one on each side — for the installation of special equipment.

In addition to the Powermatic, there are seven other transmissions offered for the 1956 line. These include a new optional heavy-duty, five-speed, manual shift unit available for 17 of the two-ton models which comprise the 5000 and 6000 series; Powerglide for the sedan delivery; standard three-speed; three-speed with overdrive; heavy-duty three-speed; conventional four-speed; and four-speed Hydra-Matic for all conventional 1½-ton models.

There is a total of nine more powerful V-8 and six cylinder engines—four in the eight-cylinder category and five in the six group. Improvements, in addition to increased horsepower, include oil bath air cleaners for the half-ton and 1½ ton models, a new fixed screen oil pump intake, and an optional full-flow oil filter for the eights. An optional governor is available for the highest power truck V-8 engine.

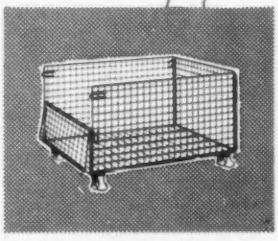
The Trademaster and the Taskmaster models use the same V-8 which is rated at 155 hp, 10 more than in 1955. Though it has the same horsepower rating as the Trademaster, the Taskmaster is equipped with valve rotators, full chrome top compression rings and positive crankcase ventilation. When used with a "power package" in the sedan delivery, the passenger car Turbo-Fire V-8 turns out 205 hp. The three versions of the Thriftmaster 6, though differing in some components, all generate 140 hp, 17 more than in 1955. The improved Jobmaster 6 has a 148-hp rating, an increase of eight. All engines utilize an improved 12-v ignition system.

Tubeless tires are standard on all models. With the tubeless tires, Chevrolet has introduced a new wheel mounting that is said to be lighter and more durable—especially in the case of duals. The new wheel mounting uses single and double cone nuts which allow each of the dual wheels to be retained separately and independently.

AUTOMOTIVE INDUSTRIES KEEPS YOU INFORMED

USP Warehouse Palletainers cut inventory costs. Contents are always visible for rapid inventory. Hinged front section permits easy access, even when units are stacked. *Anything* contained by a 2" mesh can be stored more quickly and safely in Palletainers.

Serving industry everywhere!



USP Warehouse type Palletainer features the half-drop end gate for easy access. 2,000 to 4,000 lb capacities.

Warehousing small parts in large quantities? USP Palletainers are the most practical, economical solution for achieving better space utilization plus efficient handling.

Specifically . . . USP Palletainers of the *warehouse* type offer you amazing versatilities for maintaining warehouse stocks conveniently — with contents always visible for fast, easy selection—plus savings in space—complete stacking safety, ease of transport and shipping. All these, plus the 75% storage space savings made possible by the *exclusive* "flat-fold" feature.

USP Palletainers have eliminated the guesswork from warehouse parts handling and storage operation. See for yourself how easily they will solve your problems.

UNION STEEL PRODUCTS CO., Albion, Michigan

USP PALLETAINERS

GENTLEMEN:
Please send me complete information on USP Palletainer application.

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

☐ Please have one of your materials handling engineers contact me at once.

Top
QUALITY
CONTROL
calls for RECORDED EXACTNESS

Myriads of details go hand in hand with Quality Control. For one example, at the onset of production, a casting is "destroyed" by sectionalizing to determine dimensional accuracy. Irregularities can be corrected, molding methods acknowledged, and the general structure can be proved before subsequent costs are expended.

As illustrated above, the transparent "sectional template" visually approves interior members and voids, as well as outlines finish surface adequacy for the record.

Complete progress is recorded, and any time after inception —costs, revisions, equipment function, production details . . . and even difficulties encountered can be itemized with exactness.

It all adds up to *top quality control* service. This service can be *your* service. Write or call for complete information.

UNITCAST CORPORATION, Toledo 9, Ohio
In Canada: CANADIAN-UNITCAST STEEL, LTD., Sherbrooke, Quebec.

Unitcast

QUALITY
STEEL
CASTINGS

Buick's New Axle Department

(*Continued from page* 51)

features many innovations when compared with conventional practice. In the interest of space economy, the assembly line has been compacted in the form of an L, with a closed conveyor line facilitating operations on both sides, as illustrated. First operation is the pressing-in of front and rear pinion bearing outer races in the carrier. Then follows a unique operation in a special Kirkman machine. Here the rear pinion bearing is placed in position, rotated, and a reading taken from the rear bearing to the cross bore while held under a pressure of 1400 psi. This reading is recorded for later use.

At this point the differential case assembly comes in on a feeder conveyor and is ready for installation. First operation is the pressing-in of side bearing outer races in a battery of six-ton American vertical hydraulic presses, followed by checking the mating of the ring and pinion gear. Numerous detail operations follow until the differential case is ready for installation in the carrier.

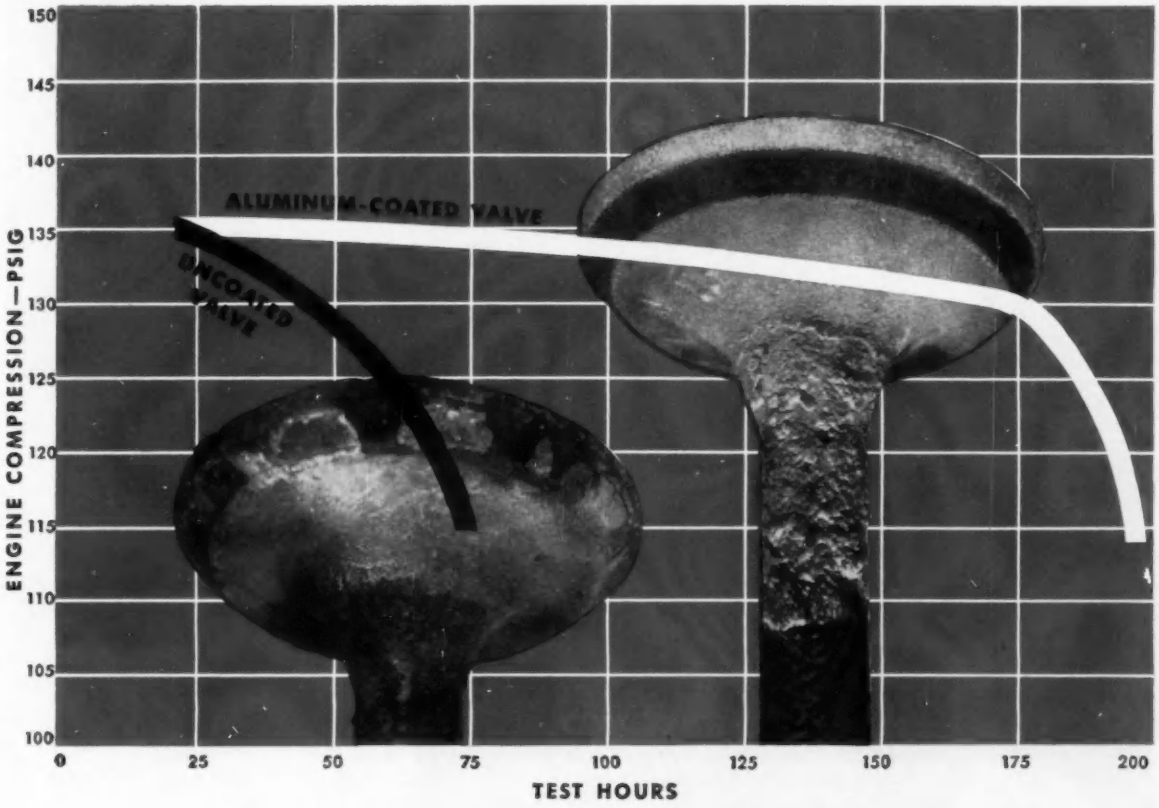
Here Buick has installed a unique method of precision checking for the selection of back-lash and preload spacers, eliminating the usual manual feeler gages. The arrangement consists of a set of three Parker electrical linear displacement instruments for measuring the gap on each side, the instrument reading being actuated by a special feeler, having blades of wedge form. The readings on the instruments are recorded on the carrier to provide the key to the thickness of the spacers to be installed at the next station. Here they have provided a special fixture for spreading the pedestals to permit installation of shims, spreading being done by means of an Ingersoll-Rand air motor.

BOOKS . . .

METAL POWDER ASSOCIATION PROCEEDINGS, *published by Metal Powder Association, 420 Lexington Ave., New York 17, N. Y. Price, $3.00 per volume.* The proceedings of the eleventh annual meeting sponsored by the association for the metal powder producing and consuming industry, and held May 11-12, 1955, are published in two volumes. Volume I contains the papers and discussions presented at the general session on powder metallurgy; and Volume II contains the papers and discussions given at the electronic core session.

186% longer life

with Thompson Aluminum-Coated Valves



Here's a long-lasting remedy for reduced valve life caused by corrosion... the Thompson method of coating exhaust and intake valves with aluminum.

Tests show that Thompson aluminum-coated valves last up to 186% longer than uncoated valves under identical conditions.

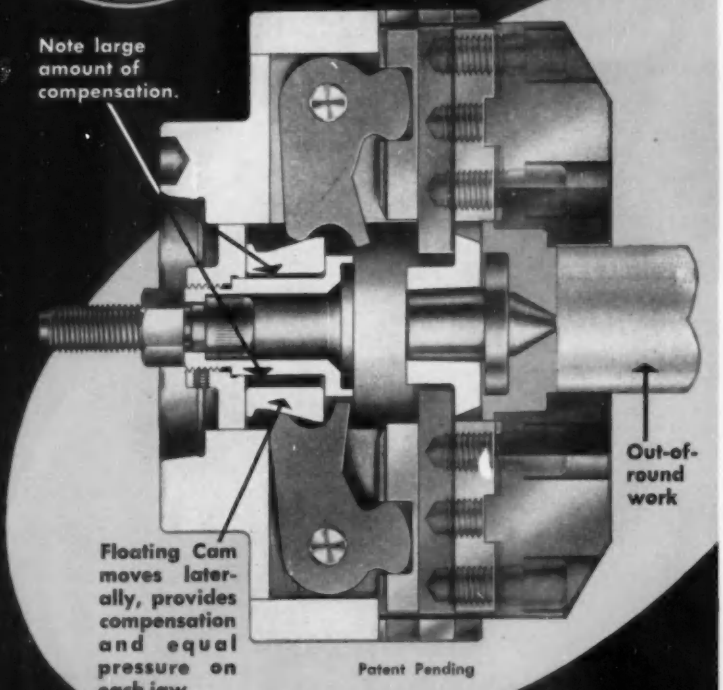
The Thompson process of applying aluminum to the valve assures penetration of the steel by the corrosion-resistant aluminum. This provides protection of the valve face from erosion by hot gases and corrosive agents from combustion.

Thompson sales engineers are prepared to discuss aluminum coating of exhaust and intake valves for your engines. Write today for information and engineering data.

Valve Division Thompson Products, Inc.

1455 EAST 185th ST. • CLEVELAND 10, OHIO

New— COMPENSATING POWER CHUCKS


Note large amount of compensation.
Out-of-round work
Floating Cam moves laterally, provides compensation and equal pressure on each jaw.
Patent Pending

Grip out-of-round work

Rough forgings, out-of-round castings, finished pieces with round or irregular gripping surfaces . . . the S-P Compensating Power Chuck grips them all, with equal pressure on each jaw. The famous S-P cam and lever action provides longer jaw travel and greater gripping power, that permits cost-cutting heavy feeds and multiple cuts.

Available in 8", 10", 12" sizes; 2- and 3-jaw models.

Representatives in principal cities. Prompt deliveries. Send for Catalog 105, which includes S-P Self-Centering Power Chuck and Rotating Cylinders. The S-P Manufacturing Corp., 12415 Euclid Ave., Cleveland 6, Ohio.

THE S-P MFG. CORP. — Cleveland
A Bassett Company
PRECISION PRODUCTS SINCE 1916
AIR AND HYDRAULIC CYLINDERS • POWER CHUCKS • ROTATING AIR CYLINDERS
COLLET AND DRILL PRESS CHUCKS • AIR PISTONS, VALVES AND ACCESSORIES

Special Storage and Handling

(*Continued from page* 69)

small wheels and made in varying styles, some with two or three flat plywood decks, others with A-shaped or U-shaped racks. Each type is designed to handle particular parts for easy loading at storage areas and unloading at production stations.

The flat-deck material supply carts are used for distributing exceptionally small parts which have been sorted into partitioned pans and assigned to particular assembly areas. Dollies also are utilized for distributing some parts which have been stored in tubs or on special pallets.

Exhaust pipes are among the parts moved on the A-shaped racks and tubings of various types are transported on the U-shaped carts. By means of the various types of carts, 1600-lb capacity units can be moved individually to required areas or pulled in trains by lift truck.

With the aid of these materials handling and storage developments, much outdoor storage and wasted indoor floor space have been eliminated. The company reports a reduction in the amount of handling time in storing and finding parts for assembly use. Cost of distributing parts to production stations has been sliced by putting all of the in-factory movement on wheels.

Reinforced Plastic Dies

(*Continued from page* 71)

panel. The plastic die then is made directly from this. To start the operation, the wood model is coated with a parting agent such as wax or aluminum foil. Next it is boxed in and Fiberglas strands or strips of Fiberglas cloth, impregnated with resin, are laid parallel with each other until the face of the model is covered. The box then is filled with chopped glass fibers also impregnated with resin. A perforated cover is pressed down on the mass to assure thorough impregnation of the Fiberglas. The mixture is permitted to harden under a pressure of 20 psi for a period ranging from four to 72 hr.

When the die sections have set thoroughly, the box is removed and the sections machined and tried out in a press.

OTTAWA 60

for DRAW DIES is *NEW...and NEWS!*

Write for a copy of the
OTTAWA 60 BLUE SHEET
This Blue Sheet contains certified data on the physical characteristics of Ottawa 60, prepared from carefully checked laboratory and field service tests. All the information you'll need on methods of handling and heat treatment, etc.
ADDRESS DEPT. AI-74

In fact, this exclusive Allegheny Ludlum-developed die steel is mighty *good* news for any user of draw dies. Ottawa 60 is a high-carbon, high-vanadium analysis, initially designed for the primary purpose of drawing stainless steel.

In that service, Ottawa 60 does just exactly what it was developed to do: it performs without galling or pickup, and shows exceptional wear-resistance—as a long list of successful applications will prove to you. Two of them are illustrated above: a stainless hinge and a stainless sundae server.

But Ottawa 60 is a top performer on any draw die application! Also illustrated above are the two draws on a transformer housing of .037" gauge SAE 1010 strip. After more than 25,000 pieces—*over 12 times any previous runs*—there was still no sign of pickup, or of wear on the Ottawa 60 punch or die.

This analysis can solve your draw-die problem jobs—or reduce your costs on almost any drawing operation. ● Call on our Mill Service Staff for any assistance. ***Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh 22, Pa.***

For complete **MODERN** Tooling, call

Allegheny Ludlum

WAD 5581

AL® FINE TOOL STEELS SINCE 1854

METALS

(*Continued from page* 94)

Copper Stocks Rise

The latest statistics from the Copper Institute flash some cautionary signals. For the first time since last August there was a substantial increase of stocks of refined copper in the hands of smelters. They totaled 61,554 tons at the end of the year; up 12,800 tons during December. Mine production climbed to over 94,000 tons and secondary to nearly 11,000 tons. Output of refined metal was the highest in December for any month of the year but deliveries were lower.

Another significant development was a cut of 1½ cents per lb in the price paid by the smelters for copper scrap, which makes electrolytic delivered 90 days hence cost about 45 cents per lb after processing. While this is still higher than the producers' official 43 cent price, it represents a considerable reduction from the 50 cent level that prevailed during the drastic shortage in 1955. Quite in line with this have been declines on the London Metal Exchange and on the N. Y. Commodity Exchange for future positions on the metal.

While copper is still in good demand — perhaps this is an understatement — interest appears confined largely to first quarter business and there is little inquiry for second quarter commitments. According to the Department of Commerce, demand is expected to exceed supply at least through the first quarter although new mine production is expected to add about 7000 tons per month to domestic mine output. Large imports are also to be expected from Chile in 1956, assuming there are no more work stoppages in that strike-ridden country, a rather bold assumption. The latest strike cost about 32,000 tons of lost production.

Highest Precision
HARDENED & GROUND PARTS

THE ball stud shown here is a perfect example of the precision methods and quality material that go into the production of all Brown Hardened and Ground Parts. Twelve separate operations are employed to produce this vital part. Every feature about this ball stud *has* to be right—every feature *is*. It has strength, wear resistance, precision fit, true-ground spherical and tapered surfaces, close inspection and strict uniformity.

Brown Hardened and Ground Parts have been serving the automotive industry for over 40 years. We refer you to any of our long list of satisfied customers. For information pertaining to your own requirements, simply write or wire.

Henry W. Brown
PRESIDENT

Parts Include . . .
King Pins
Shackle Bolts
Shackle Pins
Brake Anchor Bolts
Countershafts
Idler Shafts
Stub Axle Shafts
Steering Ball Bolts
Beam Bolts and Bolts
5th-Wheel Rocker Shafts
Wheel Studs
Water Pump Shafts
. . . anything in the hardened and ground line, of any analysis steel, up to 4¼" diameter.

THE BROWN CORP.
213 BELLEVUE AVE. SYRACUSE, N.Y.
C. H. Ehlert, 3407 Clarendon Rd., Cleveland • N. F. Spring, 4716 Balfour Rd., Detroit • R. C. Sanderson, 5851 N. Ashland Ave., Chicago • Harry J. Windmiller, 1704 Carlton, Fort Worth • Lyle H. Johnson, 1355 Westwood Blvd., Los Angeles, Calif. • John B. Hunt, 5811 S.E. Yamhill St., Portland, Ore.

Erratic Lead Markets

Immediately after the first of the year the lead market indulged in a series of startling price gyrations that left consumers confused and irritated. The price had been stable at 15½ cents per lb since September, but within a fortnight two ½-cent advances took it to 16½ cents then back to 16 cents. The 16½-cent price was the highest since May, 1952, when lead sold at 17 cents.

Price advances were required to attract foreign lead to New York instead of London where temporarily, at least, the higher price prevailed. Imports of lead are vitally necessary for this country where domestic mine output is unable to provide more than 30 per cent of lead requirements. However, it now appears that the price on the erratic London market may not have represented actual industrial demand, but speculative buying to cover short contracts, as it soon softened.

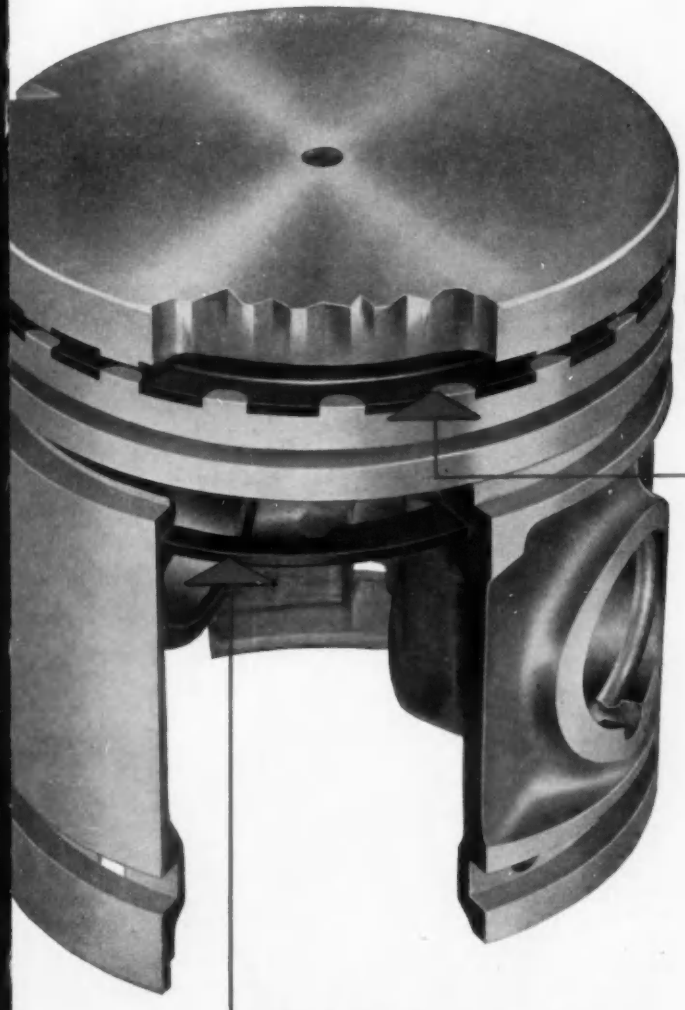
Whether Washington will continue to offer to buy lead for the stockpile at the new price is a moot question. The combined price of lead and zinc is now well above the 28-cent limit formerly endorsed by the Government. It was sustained Government buying that pulled both lead and zinc producers out of the depressed market in 1954. Stockpile objectives are still a considerable way from being completed, but with industrial demand for both metals as strong as it is now further purchases might be deferred.

Demand for Zinc Continues

The price advances in lead were followed by a ½-cent markup for zinc in early January to 13½ cents per lb. Prices of both metals usually

(*Turn to page* 120, *please*)

NOW! STERLING CONFORMATIC* PISTONS



CONFORMATIC STEEL CONTROL MEMBER, anchored at the pin bosses only, controls skirt clearance . . . hot or cold! The metered steel insert allows you to specify the piston clearance *you* want for your engine. (Clearances from zero to ½ thousandth inch are generally recommended.)

are available with LOW COST Intra-Cast* STEEL-LINED GROOVES

***Steel protection—top and bottom*—gives sensationally longer life to rings and grooves.**

This ring is *integrally cast* into the piston . . . positioned so that when the grooves are machined, the top ring groove is *lined with steel* and has islands of aluminum for ring cooling. This Intra-Cast steel-protected groove resists enlargement and materially reduces top ring land wear and rounding. And, it does it at far less cost than other methods.

** Tradename Registered*

STERLING ALUMINUM PRODUCTS INC.

ST. LOUIS, MISSOURI

New Concept of Auto Clock Perfection

DEVELOPED BY RENOWNED

LUX TIMER LABORATORIES

Keeps Time Accurately — all the Time

Here at last, an automobile clock that duplicates perfection of choicest timepieces. Keeps telling time accurately . . . without setting any "Fast-Slow" regulator.

Regulates Automatically

Just set the clock . . . it regulates itself automatically. Engineered friction arrangement on setting shaft accomplishes self-regulating compensation.

Exclusive Mechanical Break

Sensational mechanical break on contact mechanism eliminates freezing of contacts . . . increases contact life-expectancy to 30 years by laboratory tests.

Dials, mountings etc. are custom styled for individuality . . . wide size range meets specifications of all automobile manufacturers.

Write for Specifications and Complete Performance Data.

DEPARTMENT A

THE LUX CLOCK MFG. CO., INC.

WATERBURY 20, CONNECTICUT

AUTOMATION News Report

(*Continued from page* 72)

Too much precision is being built into conveying equipment, said the president of a major conveyor manufacturing firm in a recent interview. He feels that some customers are paying more than necessary for this equipment, because they call for closer tolerances and accuracy than is required to do the job. He added that a cost-conscious supplier can sometimes win a contract on price by helping the customer's plant engineer rearrange his machinery for more efficient production, in addition to providing automation machinery.

COMPANIES

Cannon Electric Co., Los Angeles, has purchased most of the assets of Diamond Manufacturing Co., of Wakefield, Mass. Roger Bowen, Cannon chief engineer, is the manager of the new Diamond Div., and Wayne Pulioca continues as sales manager.

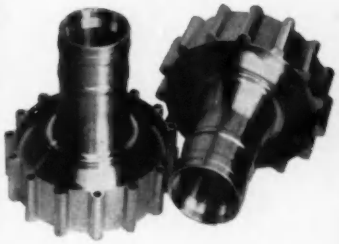
The merger of Square D Co. of Detroit and Electric Controller and Manufacturing Co. of Cleveland was completed last month. ECM will be operated as a division. F. W. Magin is now chairman and A. G. Paterson, formerly president of ECM, is now president of Square D. Dr. J. D. Leitch and A. C. Dyer of ECM were named vice-presidents and directors of Square D.

MEETINGS

"Automatic Controls" is the subject of the fifth annual conference of the Cleveland chapter of American Institute of Industrial Engineers, March 15-16. Information is available from W. S. Ritchie, AIIE, Room 330, 2123 9th St., Cleveland 15.

A plant layout technical workshop, a study and work clinic for junior executives in this field, is to be operated for two five-day sessions in April at the Pittsburgh, Pa., airport hotel. Registration of $300 includes 5000-sq ft layout of participant's plant. Details may be obtained from Plant Layout Technical Workshop, Box 233, Oakmont (Alleg. Co.), Penna.

A conference on design of high-speed production equipment will be held May 14-17 concurrently with the Clapp & Poliak Design Engineering Show at Convention Hall, Philadelphia. Sponsored by The American Society of Mechanical Engineers, the conference will stress personnel, cost reduction, materials, and miniaturization.



There's a first-cost advantage when your Bor-Dril operation can be done on a Standard Ex-Cell-O Machine. This Style 112-D Precision Boring Machine is Bor-Drilling 14 holes from the solid on the part shown above.

Short Cut in Long Hole Drilling

EX-CELL-O'S BOR-DRIL METHOD

Bor-Dril is a new cost-reducing way to drive gun drills. It makes possible high production with accuracy on long holes from solid, maintaining finish size. Also it finish-machines cored holes in castings in one operation. Since its recent introduction by Ex-Cell-O, Bor-Dril is saving money on many newly developed applications. Range of hole sizes is large, and the process takes widely varied sizes and shapes of parts made of steel, cast-iron, bronze, aluminum, magnesium and titanium. For more information on Bor-Dril, or for a quotation on a machine equipped for this work, call in your local Ex-Cell-O Representative or contact Ex-Cell-O in Detroit.

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES
CUTTING TOOLS • RAILROAD PINS AND BUSINGS • DRILL JIG BUSHINGS
AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

56-6

The Lepel line of induction heating units represents the most advanced thought in the field of electronics as well as the most practical and efficient source of heat yet developed for industrial heating. With a background of half a century of electrical and metallurgical experience, the name Lepel has become the symbol for quality in induction heating equipment embodying the highest standards of engineering achievement, dependable low cost operation and safety.

If you are interested in the application of induction heating you are invited to send samples of the work with specifications of the operations to be performed. Our engineers will process these samples and return the completed job with full data and recommendations without any cost or obligation.

TYPICAL INDUCTION HEATING APPLICATIONS

The illustration shows a lens grinding block being heated within the dome-shaped work coil. The heat-generated in the metal block softens the pitch enabling the operator to remove the ground lenses and insert the next batch. The entire operation is completed in a few seconds.

A widely used application in which several assemblies, consisting of a brass body, six radiator fins and a mounting stud, are being soldered simultaneously. The production of similar parts can be further increased by using two work coils and a change-over switch.

Electronic Tube Generators—1 KW; 2½KW; 5 KW; 10 KW; 20 KW; 30 KW; 50 KW; 75 KW; 100 KW.
Spark Gap Converters 2 KW; 4 KW; 7½ KW; 15 KW; 30 KW.

WRITE FOR THE NEW LEPEL CATALOG . . . 36 illustrated pages packed with valuable information.

All Lepel equipment is certified to comply with the requirements of the Federal Communications Commission.

LEPEL HIGH FREQUENCY LABORATORIES, INC.
55th STREET and 37th AVENUE, WOODSIDE 77, NEW YORK CITY, N. Y.

METALS

(*Continued from page* 116)

move more or less in unison so the rise was not unexpected. Business has been extraordinarily good for the zinc producers with annual records broken for 1955. Galvanizing was still the major sales outlet, but die-casting ran it a creditable second.

Last October an abortive attempt was made to shove up the price of zinc to the present level. It drew a blast from the die-casters who threatened to use substitute materials unless the price was reduced, and producers hastened to make peace. Conditions now are somewhat different with the London price high enough to divert some foreign zinc, which would normally be sold here, to that market. But the feeling in the trade is none too sanguine that the 13½-cent price can hold for long, particularly because of the cutbacks in Detroit automobile production, the largest market for die-casting.

Miscellania

Highly optimistic forecasts of *aluminum* demand have been voiced by company executives with estimates of close to 2 million tons required in 1956 compared with 1,550,000 tons supplied in 1955. . . . *Tin* is firm at a $1.07 per lb, reflecting good business in tin plate and improved statistical position. . . . Dollar value of *titanium* mill products in 1956 will exceed $120 million. About 90 per cent of the metal now being produced is for military aircraft. . . . Heavy demand and a short supply of *selenium* have caused a critical shortage with prices reaching $10.50 per lb. The present supply is a by-product obtained from anode mud in electrolytic production of copper. . . . Demand has been good for *mercury* and the price has strengthened to $280 per flask. . . . Domestic output of *cobalt* has risen with the Calera Refinery now operating satisfactorily. Consumption is expected to improve as a better supply is assured.

AUTOMOTIVE INDUSTRIES . . .
Is your News Magazine of Automotive and Aviation
MANUFACTURING

DESIGNED TO YOUR ENGINE REQUIREMENTS

saves fuel and boosts engine horsepower

Warner designers are working with manufacturers of internal combustion engines to supply custom-engineered *electric* fan clutches which reduce fuel consumption and increase engine horsepower. These small, low-cost Warner Electric Clutches disengage the radiator fan of automobiles, trucks, buses, or stationary engines when cooling is not required, and re-engage the fan when necessary. The electro-magnetic principle permits cycling the fan *on* and *off* by means of a thermostatic control.

It's a simple, trouble-free system that can add powerful new sales features to your product, including faster warmup, easier starting in cold weather, reduction of engine noise and sludging, increased horsepower, and considerable reduction in fuel consumption. These clutches are designed to your specific requirements and produced by methods geared to the needs of large-quantity users. Use the coupon below to get complete information and test data.

WARNER

Beat competition with

ELECTRIC BRAKES AND CLUTCHES

Warner Electric Brake & Clutch Co. • Beloit, Wisconsin

Warner Electric Brake & Clutch Co.
Dept. AI, Beloit, Wisconsin

Write for new Warner "Technical Report" on Radiator Fan Clutches.

Name_____

Company Name_____

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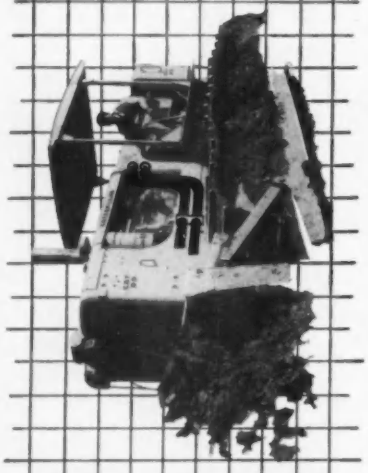
City_____ Zone____ State_____

TELEFLEX® SOLVES CONTROL PROBLEM:



HOW TO START a Cat Diesel Tractor— ALWAYS!

Problem: a 30-ton Caterpillar D9 Diesel Tractor; provide gasoline starting engine with choke and throttle controls that *always* work!

Caterpillar engineers solved this one with a 56" Teleflex control linkage. Running from the dashboard to the gasoline starting engine, the closed Teleflex system follows a curved path and is armored for complete protection. With Teleflex, operators find that the starting controls of their big yellow D9s work regardless of ice, snow, mud or dust. There's no wobble, no rattle; the controls retain their "feel" and accuracy.

ANOTHER CONTROL JOB— SOLVED WITH TELEFLEX!

Teleflex is a compact, single-path control linkage that follows any desired devious route. A flexible, rack-like cable, operating through precisely drawn conduit, transfers linear, arc, or rotary controlling motion as tension or compression push-pull motion. Wherever rotary motion, up to a full revolution or more, is required, the cable helix meshes precisely with a hobbed control wheel.

A VARIETY OF CONTROL APPLICATIONS

plus product, design and engineering information, are illustrated in descriptive *Bulletin 500*. Send for a copy to TELEFLEX INCORPORATED, 125 S. Main Street, North Wales 1, Pa.

TELEFLEX

MECHANICAL CONTROLS

LINKAGES MECHANISMS

SAE Annual Meeting

(*Continued from page* 98)

and MHT; up to 450 F—HALMO and M-1.

The advantage of a slightly higher hot hardness of MHT material in comparison to SAE 52100 is outweighed by the difficulty in producing a clean steel. In conventional air melting practices it is difficult to consistently control the cleanliness of this alloy since aluminum has a strong affinity for oxygen and nitrogen and precipitates as harmful inclusions in the melt.

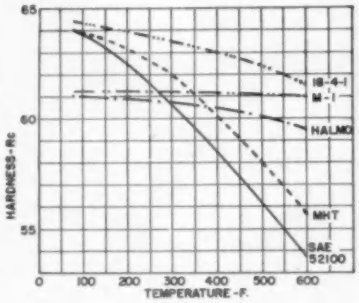


Fig. 1—Effect of temperature on the hot hardness of typical materials for the races and balls or rollers of bearings

A chief advantage of the bearings produced from HALMO and M-1 is that they are tempered above the operating limit of 450 F. In contrast the SAE 52100 bearings are tempered at approximately the maximum operating temperature limit which results in their being very susceptible to over-tempering if they overheat during operation. Once they exceed the tempering temperature and soften they do not maintain their load carrying ability and soon fail.

The frictional properties of a high temperature bearing are affected by the coefficient of expansion of the components. The lowest coefficient of expansion of currently used bearing steels is exhibited by M-1 while SAE 52100 has the greatest. A low coefficient of expansion minimizes dimensional instability and the result is to maintain a low coefficient of friction.

The selection of materials for the cage in a bearing has not been the major problem, but it is probable that this component will require more attention as the operating temperature increases. Current SAE 52100 and M-1 bearings generally use a wrought

New! PATTON oil seal puller

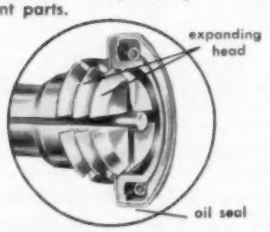
SAVE TIME.. MONEY

New oil seal puller does the job quickly and easily without damage to parts and castings.

The Patton Oil Seal Puller was designed to eliminate the waste of time in removing oil seals. In addition to the time-saving advantages, this precision tool prevents scoring and damage to the metal seat that holds the oil seal.

The complete set consists of six expanding heads and two hammers. The size range, from ⅜" to 4½", handles all oil seals in general use. Larger or special sizes may be custom made for specific requirements.

Originally designed for the Armed Forces, the Patton Oil Seal Puller is now used by maintenance and repair shops in the following industries: aircraft, automotive, agriculture, construction, marine and oil fields. In fact, wherever machinery and equipment are repaired, Patton Oil Seal Pullers save costly man hours and prevent unnecessary damage to component parts.



Guaranteed All parts of the Patton Oil Seal Pullers are fully guaranteed by the manufacturer. Each item is thoroughly tested before shipment. Only high quality tool steel is used in the expanding head. Small nicks in the lips of the expanding head, caused by improper care, do not greatly impair the efficiency of this tool.

Contact your local bearing or supply house for more details or write the factory.

PATTON MANUFACTURING CO., INC.
1802 West Pleasant St.
Springfield, Ohio

DU PONT ANNOUNCES LINO-WRIT 2

OSCILLOGRAPHIC RECORDING PAPER

• Supplied in splice-free rolls.	• Takes pencil or ink marking easily.
• Faster, higher-contrast results.	• Standard weight or extra-thin stock.

No matter what your use of oscillographic paper – for dynamic testing of aircraft or for mass spectrometry in the laboratory – Du Pont Lino-Writ 2 will do the job better!

Lino-Writ 2 is supplied in *splice-free* rolls up to 400 feet . . . no danger of losing an important part of a test record on the splice. Instrument jamming is reduced, too.

Lino-Writ 2 has higher speed. It is designed to provide an ample margin of sensitivity in critical recording at intermediate frequencies where high paper travel rates are required. Also, this plus in speed will permit the use of lower lamp voltages.

New Lino-Writ 2 oscillographic recording paper takes markings from pencils, liquid ink or ballpoint pens . . . facilitating analysis of test data. And, you can get Lino-Writ 2 in all Lino-Writ sizes for every recording purpose. It's supplied in Type B—standard weight, and tough, extra-thin Type W.

For cleaner, high contrast recordings, use Du Pont 57-D Developer or high speed Lino-Writ Developer and 10-F Fixer . . . records are ready to scan after 15 to 20 seconds! If you use a stabilization processor, the Lino-Writ Rapid Processing Chemicals Kit is specially designed to give fast, stain-free results.

If you'd like more information about Lino-Writ 2, just mail the coupon below for a free fact-filled booklet.

DU PONT

OSCILLOGRAPHIC PRODUCTS

DU PONT

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BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

E. I. du Pont de Nemours & Co. (Inc.)
Photo Products Department
2420-17 Nemours Building, Wilmington 98, Delaware

Please send me information about new Lino-Writ 2 and Lino-Writ processing chemicals.

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Firm _____

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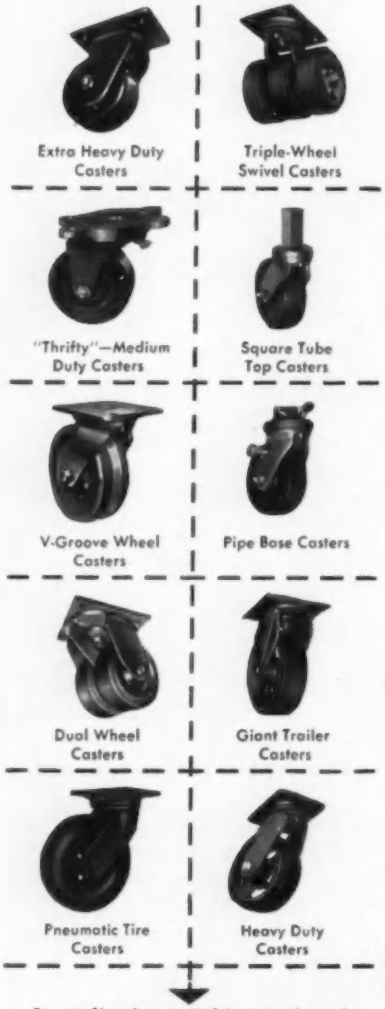
City _____ *State* _____

182

ALBION
INDUSTRIAL CASTERS



Immediately available in a broad range of sizes, types and capacities to meet every conceivable industrial application.

Specify Albion, when you need rugged dependability, complete protection . . . plus amazing economies.

ALBION INDUSTRIES Inc.

ALBION • MICHIGAN

iron-silicon bronze instead of a wrought two phase α-β brass alloy, which are both silver plated. These materials are generally considered to be suitable for bearings operating at a temperature up to 350 F.

Cast "S" Monel, with a black oxide finish, is being considered as the cage material for HALMO and M-1 bearings operating at temperatures up to 450 F. Insufficient data are available to indicate that the cast "S" Monel, brass or a bronze, would be the better performing cage material for these bearings. It is significant to note that the cage material with the lowest coefficient of expansion is the cast "S" Monel.

It is believed that a successful high temperature bearing should consist of materials for the cage, ball and race that have a similar coefficient of expansion. The acceptance of this consideration also indicates that the combination of HALMO and cast "S" Monel should produce a satisfactory bearing capable of operating at temperatures up to 600 F.

It is our belief that the optimum steel for bearings should contain no inclusions. This requirement, if applied to steels produced by conventional air melting practices, would imply that no bearings could be produced since the steel could not be manufactured. A significant reduction in inclusion content is realized if vacuum melted steels are required for bearings.

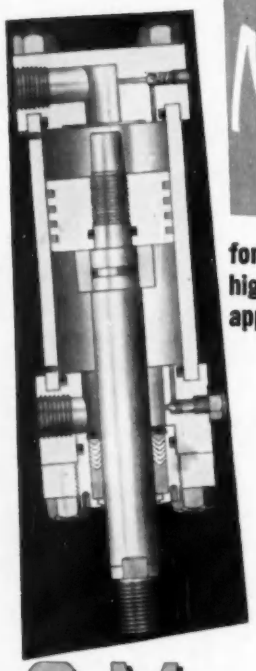
Turbocharging High Speed, High Output Diesel Engines

By N. M. Reiners and W. E. Woollenweber

Cummins Engine Company, Inc.

INITIAL tests in 1951 were conducted by applying a commercially available turbocharger to our production 6 cylinder, 5⅛ x 6 engine. Several serious limitations were found to exist, primarily of an operational nature; namely, poor automotive torque characteristics with excessive exhaust smoke at the lower end of the working speed range, poor power response with excessive exhaust smoke on acceleration, and limited maximum allowable operating temperature and rotating speed of the turbine wheel. All of these factors, either singularly or in combination, curtailed the performance of the engine at high output.

The results of continued develop-



New

for high pressure applications

O-M Heavy Duty

HYDRAULIC CYLINDER

O-M's new hydraulic cylinder conservatively rated at 2000 PSI has been developed to provide maximum performance with minimum maintenance in heavy industrial applications.

Heavy walled seamless steel tubing micro-honed for minimum friction. Rolled steel heads recessed to confine tube, prevent breathing, leakage. Piston rods high tensile steel hard chrome plated. Long-lived, self-compensating rod gland packing . . . removable without disassembling cylinder. *Available in bore sizes 1½" to 8" inclusive.*

Meets JIC standards

Send for FREE bulletin 105.

Shows complete engineering drawings, mounts, mounting brackets, performance data.

ORTMAN-MILLER MACHINE CO.
17 143rd Street, Hammond, Ind.
Please send FREE bulletin 105
Name_____ Position_____
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Marman Clamps Simplify Installation and Servicing of Engine Accessories

The two Marman clamps on this engine air cleaner show how Marman simplifies fastening and joining problems. The "T" bolt clamp holds the cleaner securely in place yet uncouples quickly for servicing. The universal band clamp below it couples the cleaner to the flexible air duct, simply, securely, inexpensively.

Marman's complete line of straps, clamps and couplings have limitless applications for fastening, positioning, joining and sealing engine components and accessories. Let Marman simplify your design and production problems. Write today for full information.

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A SUBSIDIARY OF Aeroquip CORPORATION

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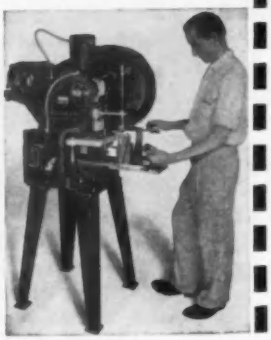
MARMAN PRODUCTS ARE MANUFACTURED UNDER VARIOUS U.S., CANADIAN AND FOREIGN PATENTS AND OTHER PATENTS PENDING

"PUSH BUTTON" MARKING of any product or part is now possible with—ACROMARK MARKING MACHINES

This is the No. 1 Model of Name-Plate Stamping Machine. It stamps serial numbers and other data into name-plates and parts.

The No. 2A Model Name-Plate Stamping Press shown below, automatically fills in all data and serial numbering on name plates, then stacks them. A printed record of each marking is job-ticket recorded in the next larger model.



These are only two of the hundreds of different kinds of marking and numbering machines made by ACROMARK.

Write today for complete catalog of more than 500 marking tools and machines —or ask about proper equipment for your marking.

The ACROMARK Company

303 Morrell St., Elizabeth 4, N. J.

"The Original Marking Specialists"

ment of turbocharged high speed, high output engines may be summarized as follows:

It is possible by proper combination of the turbocharger air delivery and fuel pump delivery to produce various types of engine torque curves. A rising torque curve of the desired character for vehicle operation is now attainable.

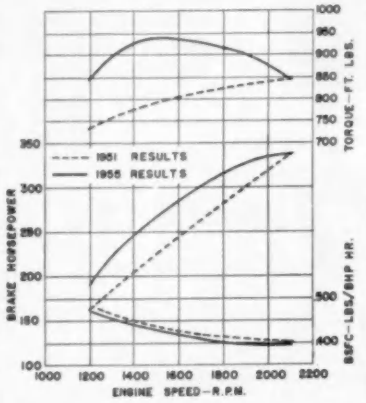
Maximum power output of the basic Cummins NH engine has been increased by turbocharging to 171 bmep or 67-½ per cent over the naturally aspirated rating; fuel consumption has been appreciably reduced as compared with the supercharged engine.

As high specific outputs are reached, cylinder scavenging can and must be accomplished to keep exhaust temperatures at permissible values; exhaust manifolding and turbocharger overall efficiency become increasingly important factors in attaining high output.

Operation of the turbocharged engine during transient periods has been improved from entirely unsatisfactory results shown in 1951 to the excellent results of 1955. This has been accomplished by refinements in exhaust manifolding, reduction of turbocharger rotor inertia, and increasing turbocharger overall efficiency.

The turbocharged engine can be rated at sea level power up to various altitudes depending on the capability of the turbocharger to compensate for air density loss. High output engines require a high pressure ratio turbocharger with adequate speed capacity for operation without derating.

At high specific output, sea level power may be maintained at maximum engine speed but the engine torque curve speed range is reduced with increased altitude operation.



Torque, brake horsepower and fuel consumption comparison — 1951 and 1955 Cummins engines

DON'T GIVE ME THAT!

YOU CAN'T BEAT GARRETT SERVICE

I'm not a wise guy, but I do know about the service these Garrett plants give you. Seems hard to believe. Those fellows bend over backwards to help you out in an emergency. And their regular service means you always get deliveries when promised . . . sometimes before.

Of course, when it comes to quality they are tops on lock washers, flat washers, spring washers, hose clamps, stampings and assemblies. They have three plants equipped with the most modern high-speed automatic machinery to turn out billions of parts to exact specification . . . complete heat treating, plating and finishing facilities. If you don't believe me, next time send your order into Garrett. You'll see why their customers say YOU CAN'T BEAT GARRETT.

LOCK WASHERS
FLAT WASHERS
HOSE CLAMPS
STAMPINGS

Manufactured by

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You've Got To Be Right

WHEN PLANNING FOR AUTOMATIC PRODUCTION!

PRODUCTION MACHINERY

Let GREENLEE Help You All The Way

The stakes are large . . . the rewards are great . . . but your plans must be founded on top-flight engineering and mechanizing experience. Let Greenlee help you avoid costly mistakes . . . invite Greenlee engineers to participate right from the start . . . they're easy to work with. Their thinking is sound . . . creative . . . respected wherever production machines are used. Write or wire for a consultation today.

Ten-station transfer machine . . . an excellent example of Greenlee engineering experience applied to a specific production problem. One of three units designed and built in duplicate for a large automobile plant to machine connecting rods automatically.

Eight partially machined rods and caps (from first unit) are manually loaded at the first station. Bolt holes are drilled at the next 2 stations, inspected at station 4.

Lock slots are milled in rods; rods and caps are countersunk. At the sixth station, oil slot is milled in rods. Next, rods and caps are counterbored and lock holes milled in caps.

At the eighth station bolt holes are semi-finish reamed . . . finish reamed at the ninth. The last station automatically unloads rods and caps to conveyor.

Processing takes place at the rate of 950 rods and caps per hour. Accuracy is greater . . . production is higher than on any other type of machine previously produced.

WRITE FOR BULLETIN SM-457

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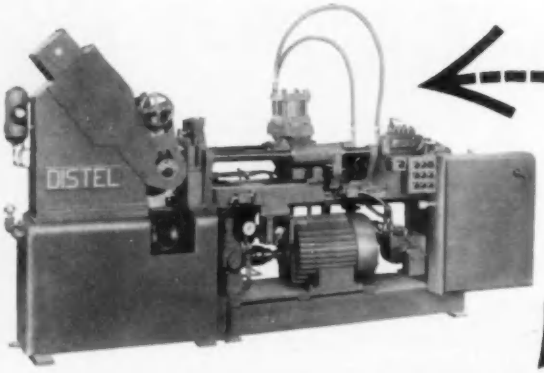

Amazing Team FOR

producing automatic transmission brake bands

a new improved roll form & cut-off machine

constant roll forming and cut-off from coil stock

No lost motion—no lost stock—hydraulic cut-off. Both ends are rolled, formed and cut-off, with no flat ends. Stock Feed Guide bars are hardened and ground.

feeds to roll form, and cuts off, after the forming

Positive locking vertically and horizontally. Heavy, much improved stock-feed runs on ball bearings. Double-action cylinders assures rigid control of lengths.

produces perfect bands

Holds the radius constant at both ends. No convex or concave surfaces.

machine can be used year after year

Readily adjusts for model changes, and diameters varying from 6" to 10".

a new improved brake bonding machine

the "merry-go-round" has 42 stations

It's a rotating machine, with completely balanced weight. Ball bearing, 6' in diameter, provides stability and eliminates vibration. One-shot lubrication for the entire machine. Loading is semi-automatic. Unloading is automatic. Each station is readily accessible.

"merry-go-round" has positive index control

Entire machine can be adjusted to the time control and indexed slower or faster. It continues to operate even if one or more stations are down.

bonds brake lining to steel by low voltage electric heating elements

It bonds 360 brake linings per hour. Pressure is from an expanding air chuck. It's controlled thermostatically at each station.

each station is a complete unit

Each station operates with its own air cylinder, signal lights and gage.

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You can evaluate copper, very simply...by looking forward.

Not backward, to yesterday. Not inward, on the problems of today. But *forward*, to tomorrow.

For the economy of using copper is *ultimate* economy. What substitute costs less than copper . . . or gives you better value . . . whenever you can figure cost *by the year?*

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Welds readily . . . excellent for soldering and brazing

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You can rely on the same research that conceived, designed and developed the now famous and much imitated *Thin-Wall Babbitt bearing.

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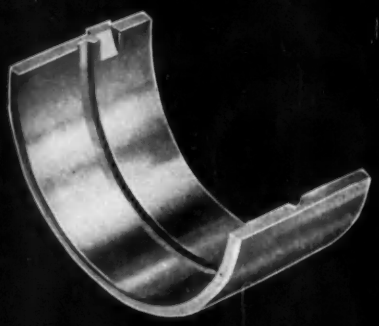

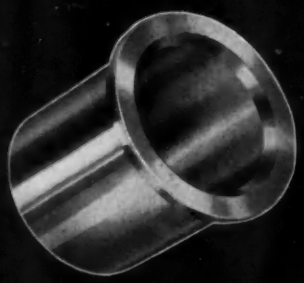

We can meet high production needs or special requirements for bearings and bushings of every type used in original equipment.

Steel backed, copper lead and aluminum alloy-lined bearings are lead-tin overplated to customer's specifications.

Tell our engineers about your requirements

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AUTOMOTIVE ENGINEERING NEWS

PROPERTY AND APPLICATION DATA ON THESE VERSATILE ENGINEERING MATERIALS: "ZYTEL," "ALATHON," "TEFLON," "LUCITE."

4 reasons for the expanded use of ZYTEL® nylon resin in 1956 models

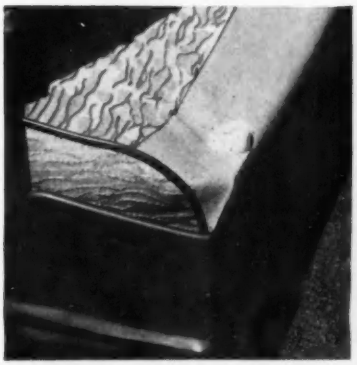
Every day, automotive engineers are selecting Du Pont "Zytel" nylon resin to replace conventional materials to produce better parts—in performance, durability and cost of manufacture.

Here are typical properties of "Zytel" that make improved parts possible.

- **Excellent abrasion resistance**
- **Light in weight**
- **Requires little or no lubrication**
- **Tough, even in thin sections**
- **Heat-resistant**
- **Resilient**
- **Economical production (molded in multi-cavity dies)**

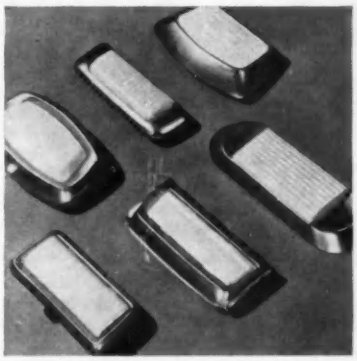
There are still other advantages in using "Zytel." For example, colors are molded right into the part—no danger of chipping or peeling off. And a single molded piece of "Zytel" can often replace a complex assembly of component parts. That means lower unit cost, faster production. Usually, no further finishing of the part is required after the molding operation.

It will pay you to examine your own automotive design requirements with "Zytel" in mind. Perhaps you can replace a component part with one of "Zytel"... lower your production costs and gain new selling points. Find out how the properties and applications of "Zytel" can help you. Send in the coupon for complete information.

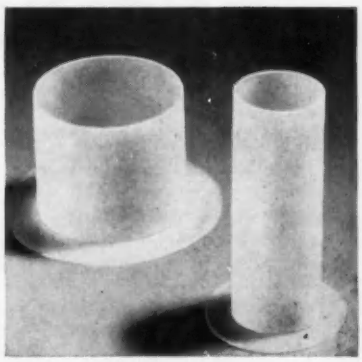


STRENGTH OF "ZYTEL" is seen in its support of the front seat. This backstop of "Zytel" is subject to constant impact and pressure, yet it will give years of trouble-free service.

RESILIENCE OF "ZYTEL" is demonstrated by this door-lock wedge. Each time the door is slammed, it absorbs the shock. The wedge keeps its shape and holds the door closed.



HEAT RESISTANCE OF "ZYTEL" is excellent for applications such as these dome light lenses. Parts made of "Zytel" nylon resin can operate at temperatures as high as 250°F.



WEAR RESISTANCE OF "ZYTEL" is shown by brake-pedal bushing. It needs little or no lubrication. Low coefficient of friction and abrasion resistance of "Zytel" permit this.

NEED MORE INFORMATION?

CLIP THE COUPON for additional data on the properties and applications of these Du Pont engineering materials.

**"Zytel," "Teflon," "Alathon" and "Lucite" are registered trade-marks of E. I. du Pont de Nemours & Co. (Inc.).*

E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Department
Room 172, Du Pont Building, Wilmington 98, Delaware
In Canada: Du Pont Company of Canada Limited, P. O. Box 660, Montreal, Quebec

Please send me more information on the Du Pont engineering materials checked: ☐ "Zytel"* nylon resin; ☐ "Teflon"* tetrafluoroethylene resin; ☐ "Alathon"* polyethylene resin; ☐ "Lucite"* acrylic resin. I am interested in evaluating these materials for_____

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if it moves...we can stop it

New lightweight . . .

Fabricated steel brake shoes weigh many pounds less than cast shoes. Binding or freezing up is eliminated because double web construction permits limited area fit with one piece cam rollers. Wear areas of the webs are heat treated for long life.

Unit-mounted . . .

All brake parts are mounted on the spider for compactness. Efficiency is higher and correct cam shaft alignment is assured with close coupled cam shaft and chamber bracket.*

"P" SERIES POWER BRAKES

designed for heavy-duty service

Here is a brake that gives longer, trouble-free service for trucks, trailers, and all types of industrial and road equipment. These heavy-duty "P" Series Brakes are easy to maintain in service. Simplicity of design is the keynote—with brake, air chamber, and cam shaft all mounted as a unit.

The outstanding features of the Timken-Detroit® "P" Series Brakes give increased economy and performance. Operating temperatures are lower and lining life longer because open-type spiders assure good internal ventilation and rapid cooling. Timken® "Econo-liners" are tapered to provide greatest thickness where greatest wear occurs.

A constant-lift "S" type cam assures uniform application of brake shoes for maximum control and immediate response. Brake adjustments are quick with easily accessible slack-adjusters. Once the adjustment is made, a lock automatically engages the adjusting screw to prevent its moving during service. Long wearing nylon bushings assure smooth operation with minimum maintenance.

"P" Series Power Brakes are available in a complete range of capacities and sizes to fit every operating requirement.

For additional information . . . with expert consultation, contact Timken-Detroit Brake Division. Complete specifications and information on the "P" Series Brake are available. And a staff of experienced engineers is ready to assist you with any problem you may encounter.

*"P" Series Brakes are also available with inboard chamber mounting for special applications.

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For every industrial, agricultural or automotive application where braking is required!

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TIMKEN Detroit BRAKES
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Want another sales point? Mention the Stainless Steel!

Some years ago, the words, "Stainless Steel" didn't mean much to most folks. It was considered just another metal.

Not so today—when even the average housewife is surrounded with Stainless Steel, in the form of pots and pans, sink-tops, fine tableware, even jewelry. In short, most people now know that Stainless Steel combines corrosion resistance and a smooth, easy-to-clean surface with style and beauty. This combination of properties is offered by no other metal on the market today, and the people know that, too!

Don't overlook this valuable sales point. Let your customers know that genuine Stainless Steel is used for the critical areas on your model; and make sure they appreciate the fact that Stainless will stay bright and new-looking with a very minimum of polishing.

When *buying* Stainless Steel, remember that United States Steel can supply the widest range of sizes, grades and finishes available in the United States.

USS STAINLESS STEEL

SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

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UNITED STATES STEEL

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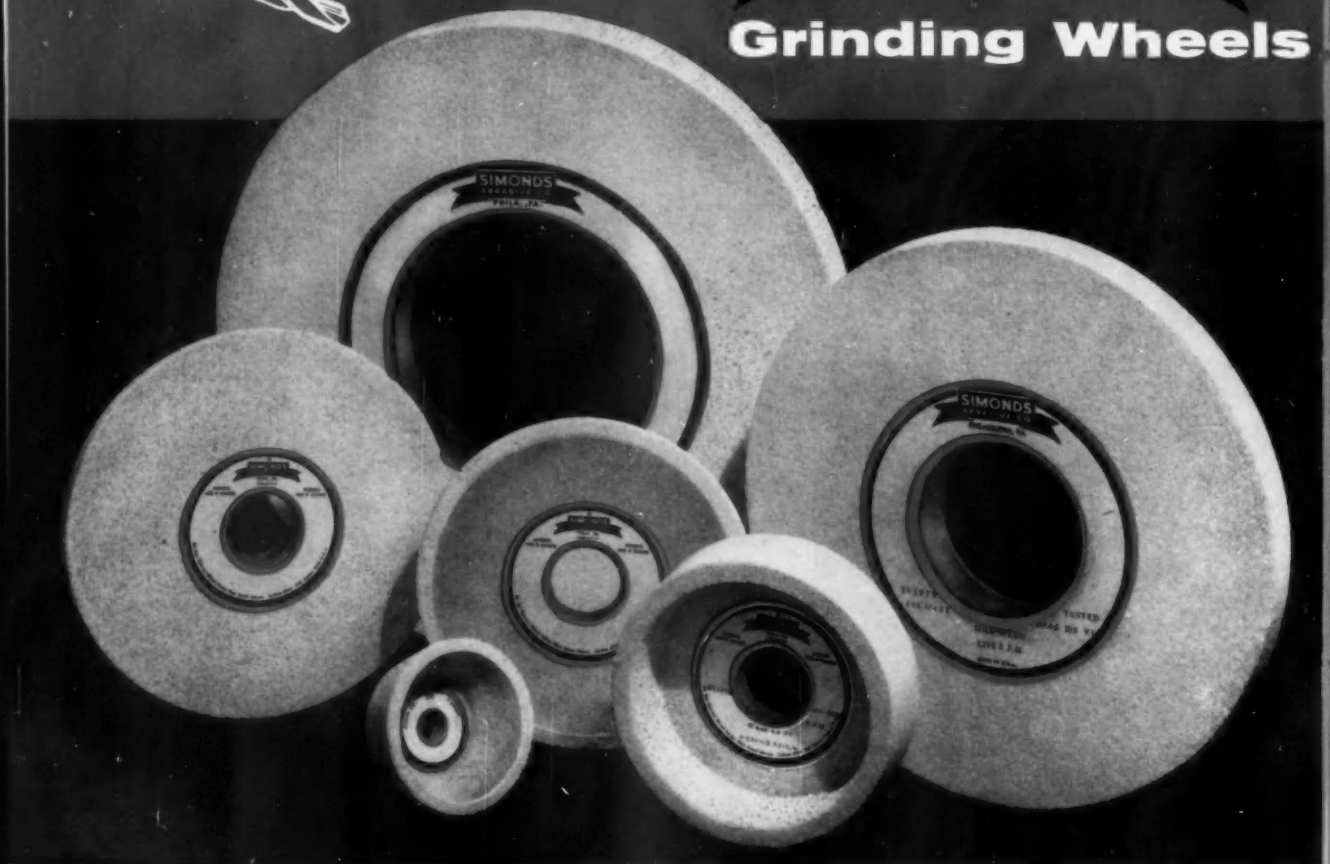
Get the BEST in tool and cutter performance with SIMONDS ABRASIVE CO. Grinding Wheels



W Borolon® White Wheels

TRADE MARK

For hardened and high speed steels, high carbon, high chrome and other alloys. For fast, cool cutting action with long wheel life, these wheels belong on *your* toolroom grinders. Made with W Borolon (special aluminum oxide abrasive) for fast stock removal and the finish you want without burning expensive steels. Engineered for true concentricity and good balance. Furnished in protective plastic bags. For consistently superior results, standardize on Simonds W Borolon White Wheels.

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Helps Give

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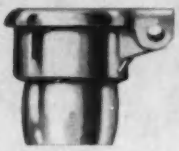
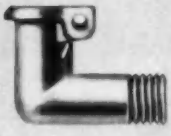


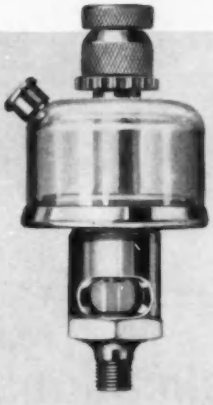
OIL HOLE COVERS

This model is designed to fit into a simple drilled hole. Ideal for use on small motors, generators, starters and light machinery—for dependable oil hole protection at moderate cost. Larger sizes frequently used as filler caps on tanks or reservoirs. Style R—No. 305.



OIL CUPS

Accurately machined from a solid brass one-piece forging, this oil cup permits safe, dependable application of lubricant at very low cost. Used widely on motors and small machinery requiring side oiling. Style L—No. 1202.



SIGHT GRAVITY FEED OILERS

Rate of oil flow regulated by needle valve, directly observed through sight glass in stem. Shut-off knob does not affect needle valve adjustment. Visible oil supply. Non-breakable. Tops in convenience and dependability, at low cost. Style NFU—No. 3602-A.

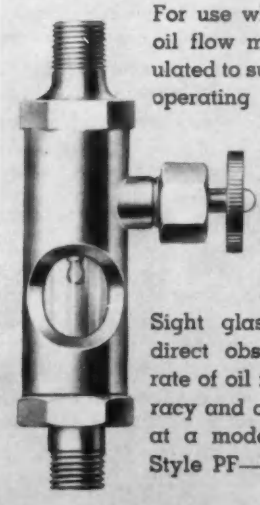
GEAR CASE GAUGES

This oil gauge plug permits instant checking of oil level within a transmission or gear case. For use where construction permits insertion in tapped hole. A valuable addition to any such equipment — at very low cost. Style BW—No. 4042.

SIGHT GRAVITY FEED MULTIPLE OILERS

This one unit replaces 3 to 8 individual oilers. Maximum practicality in a small central lubrication system. Positive cut-off during idle periods. Individual vibration-proof needle valve adjustments. With solenoid control (Illustrated): Style MDS—No. 4685-A. Without solenoid: Style MD.

SIGHT GAUGES



For use where rate of oil flow must be regulated to suit changing operating conditions. Needle valve permits extremely accurate adjustment of oil feed. Sight glass provides direct observation of rate of oil flow. Accuracy and convenience at a moderate price. Style PF—No. 4290.

Don't price yourself out of the market. When you design proper lubrication into your equipment, specify GITS Lubricating Devices—the widest selection available anywhere. The items pictured above are only a few of our many thousands of lubricating devices. At the design stage, get the GITS story. Free Engineering Service. Send NOW for your free Catalog.

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The Standard For Industry For Almost Half A Century

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Clip this page for handy "rough reference"

J. S. Coleman, President
Burroughs Corporation

"Business Publications are essential tools of management"

"To keep abreast of rapidly developing techniques in all areas of business operations," says Mr. Coleman, "is not an easy task. Yet, if management is to discharge the responsibilities laid upon it, it must be informed both of technical developments and, indeed, of events and trends of the nation as a whole."

"Without business publications," Mr. Coleman adds, "the job would be impossible. As the size and complexity of the job have grown, management has come to depend increasingly on business publications for information necessary to sound judgment."

When editorial pages are read with eagerness, advertising pages in those same publications have equally high specialized value. They provide a direct sales route for any product or service of benefit to business or professional men.

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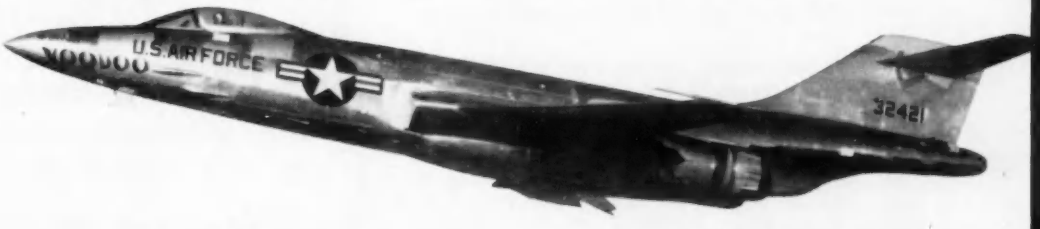
The national association of publishers of 165 technical, professional, scientific, industrial, merchandising and marketing magazines, having a combined circulation of 3,849,056... audited by either the Audit Bureau of Circulations or Business Publications Audit of Circulation, Inc.... serving and promoting the Business Press of America... bringing thousands of pages of specialized know-how and advertising to the men who make decisions in the businesses, industries, sciences and professions... pin-pointing your audience in the market of your choice. Write for list of NBP publications and the latest "Here's How" booklet, "How We Use the Business Press and Why" by William C. Sproull, Director of Advertising of the Burroughs Corp., Detroit.

An important cog in this nation's defense is this Air Force jet fighter, the F101A "Voodoo." By using laminated epoxy tooling, McDonnell Aircraft Corporation, its manufacturer, has reduced cost and speeded production of aircraft and helicopter components, some of which are incorporated in this plane. The epoxy plastic tooling compounds that are used are a product of **Ren Plastics, Inc.**, P.O. Box No. 1256, Lansing 4, Mich.

Compounds based on BAKELITE Epoxy Resins

cut production costs, tooling time



Faster, less costly production of interchangeable aircraft components results from the advantages of "Ren" plastic tooling compounds based on BAKELITE Brand Epoxy Resins. For instance:

- Overall savings as high as 40 per cent have resulted where tools are adaptable to plastic.
- Weight of plastic tools is only 25 per cent that of similar steel or kirksite tools, 60 per cent that of aluminum tools.
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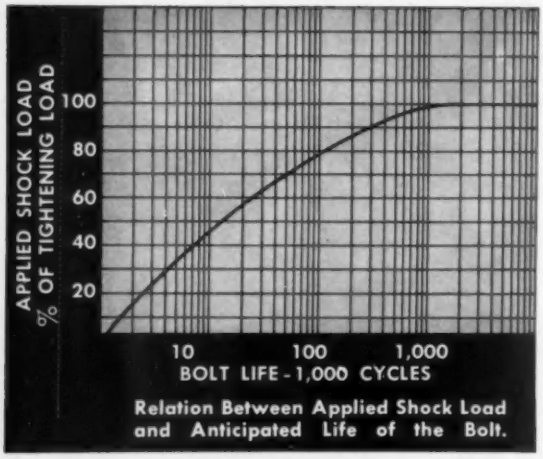

Relation Between Applied Shock Load and Anticipated Life of the Bolt.

factor to be considered, in application of finished hexagon nuts...

Figure 3, page 6 in the Engineering Section of our catalog, "Relation Between Applied Shock Load and the Anticipated Life of the Bolt," is just one of the several factors that are discussed, on pages 3, 4, 5 and 6, in the application of finished hexagon nuts, where highly stressed bolts of special material are required . . . Fourteen topics, concerning the technique in the manufacture and proper installation of our product are covered in this twenty-four page brochure—requests for this literature will be handled promptly . . . . . .

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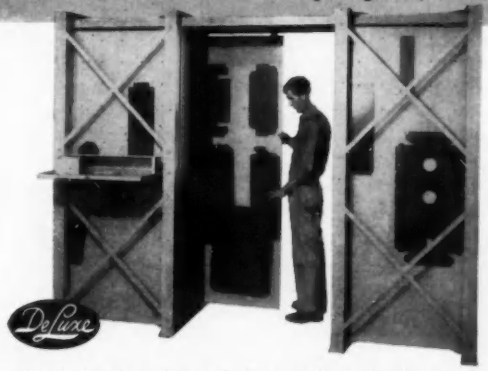

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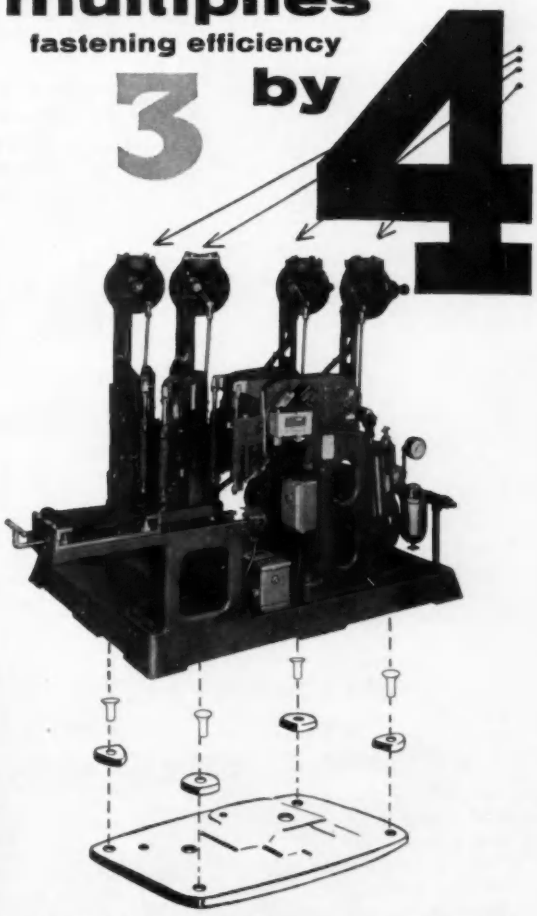

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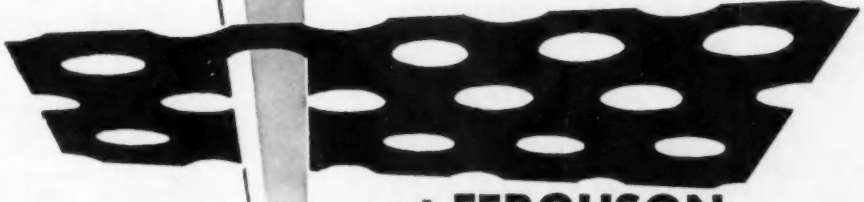

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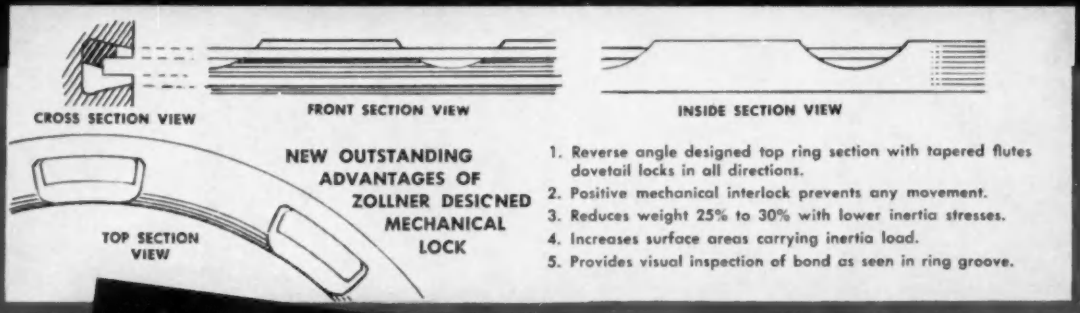
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